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ABSTRACT

This guide is designed to show architects, school board members, and educators ways to reduce the cost of school construction without impairing the educational opportunities offered to pupils, and to bring building requirements and recommendations in line with modern thinking and the newer construction materials. Its purposes are--(1) to present a convenient outline of the mandatory provisions of the school building code, (2) to point out certain design features which, although not required by the code, are considered highly desirable and are strongly recommended, and (3) to introduce, explain, interpret, or enlarge upon mandatory and recommended provisions. Introductory material includes a discussion of--(1) school planning, (2) areas for improvement, (3) site selection, (4) modernization, and (5) educational or program limitations. Specific areas covered are--(1) policy, service, and procedures relating to plan preparation, filing and approval, (2) space requirements and recommendations, (3) lighting, (4) ventilation, (5) heating, (6) sanitation, and (7) building safety. Areas of special concentration are--(1) lighting fixtures, including diagrams, and (2) building safety. (MM)

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GUIDE FOR SCHOOLHOUSE PLANNING AND CONSTRUCTION

EF 001 141

STATE BOARD OF EDUCATION

NEW JERSEY

1967

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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STATE OF NEW JERSEY
DEPARTMENT OF EDUCATION
Trenton, New Jersey

GUIDE FOR SCHOOLHOUSE PLANNING AND CONSTRUCTION

Comprising
Suggestions, Recommendations and Mandatory
Requirements Relating to the Construction
of Public School Buildings in
the State of New Jersey

Trenton, New Jersey
January, 1967

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FOREWORD

The great "tidal wave of students" which descended upon the school districts of New Jersey following the war has become a continuing flood. There are no signs pointing to an abatement of the growth of the number seeking seats in our classrooms wherein they may partake of the educational opportunities which the citizens of New Jersey have guaranteed to all of our children and the great program of school construction consisting of more than one thousand new buildings in the last decade and affecting all but a few of our school districts may even be increased in volume.

In March, 1952, the State Board of Education adopted the forerunner of this publication, which was entitled *Guide for Schoolhouse Planning and Construction*. It was an excellent guide, prepared by an earnest and talented committee of educators, architects and school board members. The controlling concern of that committee, as it is with the present committee, was to find ways to reduce the cost of school construction without impairing the educational opportunities offered to pupils, and to bring building requirements and recommendations in line with modern thinking and with the newer constructional materials. The world has moved at a greatly accelerated rate in the years since the first edition of the Guide was published. Many new materials and better construction techniques have been developed and introduced. Educational trends have become more clearly discerned. Even the best guide, if it is not periodically reviewed and revised, can slow the pace of progress like a dragging anchor. The Department of Education, therefore, has authorized several revisions of the Guide in the last twelve years, this being the latest edition.

In New Jersey's decentralized system of schools, the State often serves its function by establishing the *minimum* standards below which no district may go. Districts must consider such standards as minimum in nature. The sight-lifting suggestions and recommendations contained herein are, in our opinion, of greater importance and significance to a board of education sincerely striving to improve educational conditions than are the mandatory *minimum* requirements.

Today's school buildings should be built to house, and make effective, the educational program which a community desires and needs. Since no two communities are alike in their characteristics and needs, it follows that the same building plan can never be equally effective in serving the children of different communities.

It should be pointed out that each local Board of Education will eventually determine most of the features of a new schoolhouse. Consultation with the administration and staff concerning the nature of the educational

program to be housed should be considered so advisable as almost to be mandatory. Advantage, too, should be taken of the consultative services available from the Department of Education. It is equally as important to use foresight and wisdom in the selection of a site, especially in respect to size. And of paramount importance is the selection of an architect who can give wise guidance to the Board of Education as it makes decisions about the building problems which arise. Too much care cannot be given to the selective process by which an architect is chosen.

On behalf of the State Board of Education, which has adopted this present instrument and have made its requirements operative immediately, I wish to thank the current committee which produced this revised edition. Through many arduous conferences and meetings, with selfless sacrifice of time and energy, they have made important changes and improvements in this document which will do much to create a better environment for learning for the students of tomorrow. The names of the committee members appear on the next page.

JOSEPH E. CLAYTON
Acting Commissioner of Education

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TO OBTAIN COPIES OF THE GUIDE

Requests for copies of the Guide should be made to the Director of School Building Services, State Department of Education, 225 West State Street, Trenton, New Jersey 08625. The price is one dollar per copy. Payment must be made in advance by check or money order payable to the Commissioner of Education.

One copy of each revised edition of the Guide is issued without cost to each board of education in New Jersey and to each architect doing school plant planning in the State.

HOW TO READ THIS GUIDE

This *Guide for Schoolhouse Planning and Construction* is designed to serve a three-fold purpose.

Prepared especially for architects, school board members, and educators, it is framed especially to present a convenient outline of the mandatory provisions of the school building code. These provisions occur at various places in the Guide, the implication being that it should be read carefully in its entirety, particularly by those responsible for compliance with the statutes and the regulations of the State Board of Education.

Its second purpose is to point out, to prospective builders of school plants, certain design features which, although not required by the school building code, are considered to be highly desirable and are strongly recommended.

The *Guide* contains a third type of material, which is designed to introduce, explain, interpret, or enlarge upon mandatory and recommended provisions, or to present a point of view that will form a basis for discussion and a guide for contemplated action.

As was stated in the *Foreword,* any *Guide* to be constantly effective must be reviewed periodically. Typically only minor changes or revisions affecting only a part of the *Guide* become advisable at any one time. In the future, as changes occur, each person on the regular mailing list of the Bureau of School Building Services will receive copies of such changes.

In order that the lives, health, sight and comfort of pupils may be properly protected, all schoolhouses hereafter constructed shall comply with the regulations herein, including the entire sections entitled ***A—Policies and Services, B—Approval and Filing of Plans and Contracts, and C—Application and Conditions for Approval of Plans and Specifications.***

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PLANNING A SUCCESSFUL SCHOOL BUILDING PROGRAM

A modern instructional program which offers each child maximum learning opportunities positively relates to the physical environment evolved from the sound principles of building planning. The successful carrying-out of the school building program depends upon an orderly procedure designed to make certain that all important phases are included. The following steps are offered as guides.

1. The educational program is developed to meet the needs of the children of the Community. Assistance in program planning is available to the local district from many agencies: the State Department of Education has consultants in the elementary and secondary fields, special, vocational areas and a typical education. Arrangements can be made for this assistance through the Bureau of School Building Services or the offices of the county superintendent of schools.

2. An estimate of future pupil enrollment for the school district is made and projected grade by grade for at least a ten-year period.

3. The kind and extent of school plant facilities needed is carefully determined based on program and number of pupils.

4. Educational specifications are prepared in writing detailing all the facilities considered desirable for the program. Estimates of desired dimensions and square footage for each area should be provided together with an explanation of their proposed utilization and relationships. This should be prepared under the direction of the Superintendent of Schools or administrative principal. Assistance from educational consultants, the administrative staff, faculty, board of education, citizens, specialists and pupils is frequently utilized.

5. After the program has been developed an architect is selected through approved procedures. Assistance in the manner of selection can be obtained from the State Chapter of the American Institute of Architects.

6. The school site is selected. Accepted criteria should be applied to insure that the land will adequately contain the desired program.

7. The architect proposes a solution to the housing of the educational program in the form of schematic plans.

8. The local board of education and administrative staff study the submitted schematic plans. If modifications are desirable suggestions are made to the architect. This process continues until satisfactory plans have been evolved and the board officially approves.

9. The proposal is officially submitted to the local planning board. It is permitted 45 days to consider the project.

10. When an extension of credit is necessary, a date for a hearing is arranged with the Bureau of Business Services of the State Department of Education. This can be done directly with that bureau or through the offices of the county superintendent of schools.

11. Schematic plans shall be submitted to the Bureau of School Building Services for review at least ten days prior to the hearing.

    An official submission includes one copy each of a floor plan (preferably 1/16 scale), complete plot plan and three copies of a cost estimate on official State form. If an addition, a floor plan of the existing facilities must be included.

11b. If extension of credit is not required schematic plans should be submitted to the bureau before seeking local approval for funds. Good planning would indicate that this submission be at least sixty days prior to a referendum.

12. All necessary documents and data are prepared by local district officials in accordance with instructions from the Bureau of Business Services and the Division of Curriculum and Instruction and presented at the hearing on the extension of credit.

13. In preparing cost estimates it is advisable to consult with the State Department of Health concerning the proposed method of sewage disposal. This will enable the architect to better anticipate cost for this utility and to determine if the proposed system is approvable.

14. If the extension of credit application is approved by the Department of Education the local district will be notified by mail of the date for a meeting with the Division of Local Government.

15. Under existing statutes the Commissioner of Education is permitted 60 days for his consideration of the proposal. The Division of Local Government is also permitted 60 days for its consideration following the approval from the Department of Education. These time factors should be recognized in establishing the date for a referendum and allowing for a public information program. Also permitting time for absentee ballot advertising.

16. When approval has been granted by both state agencies a local referendum may then be held if needed.

17. If the results of the local referendum are favorable the architect prepares one set of preliminary plans which are submitted to the Bureau of School Building Services for review. This step involves two separate reviews: one by the consultants for educational adequacy and a second by the architectural review staff with reference to Guide compliance. Two separate approvals are necessary.

18. If the preliminary plans represent a satisfactory solution to the

building problem, tentative approval and authorization to proceed with the preparation of final plans is issued to the architect in writing.

19. The architect submits for review two copies each of the final plans, specifications and applications for approval.

20. If the final plans and specifications are found to comply with the rules and regulations as set forth in the Guide for Schoolhouse Planning and Construction, the architects, the superintendent, the board of education and the county superintendent of schools are advised that approval of the same has been recommended to the State Board of Education.

21. Formal approval of the final plans and specifications is made by the State Board of Education at its regular monthly meeting and official notice of such approval is sent to the local board of education, the architect and the county superintendent.

22. Advertising for bids may proceed as soon as word is received that approval of the plans and specifications has been recommended.

23. Attention is called to 18:11–8 of the Statutes which provides that bids may not be accepted or contracts awarded until *after* the plans and specifications and all addenda thereto have been approved by the State Board of Education.

24. The board of education should be aware of the regulations covered by law 18:11–9 requiring all persons bidding on school work first be classified by the State Board of Education.

25. A copy of the proposed bid awards should be submitted to the Bureau of School Building Services (on the proper form) for approval prior to the signing of construction contracts.

26. Copies of the signed contracts are forwarded to the Bureau of School Building Services for review and filing within ten days after signing. The contracts shall be filed by the secretary of the board of education.

27. a. The architect shall submit two copies of all bulletins* and addenda to the Bureau of School Building Services simultaneously with their issuance to contractors or other parties concerned. No contracts may be awarded until the amended plans and specifications are approved.

    b. The architect shall submit two copies of all change orders to the Bureau of School Building Services for approval prior to making such changes.

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* Bulletins are defined as explanatory material only.

No change orders may be authorized until after contracts have been awarded.

28. Upon approval of change orders by the State Board of Education, a copy of the change order, marked "Approved", will be sent to the board of education for its information and files. The architect is notified of the approval by letter.

29. The architect shall advise the Bureau at least ten days before a closing in or plastering that the building is ready for preliminary inspection.**

30. If the inspection reveals that plans and specifications have been complied with, the architect will be notified in writing to proceed with construction.

31. When in the opinion of the architect the building is completed, he shall notify the Bureau accordingly and final inspection will be made.

32. If the inspection indicates that the work has been completed in accordance with the plans and specifications, notice to that effect will be issued to the board of education, the architect and the county superintendent.

33. The board of education accepts the building upon certification by the architect that the project has been completed in accordance with the plans and specifications.

34. The superintendent of schools, his staff, the board of education and the architect orient custodians, maintenance staff, and educational staff in the operation of equipment, housekeeping, maintenance and use of the building in order to utilize the building as effectively as possible and to assure its proper care and maintenance.

SIGHT-LIFTING

1. General

Administrative Offices: A well-planned office unit should provide space for the reception of students and visitors, the work of secretaries and student-assistants, private offices for each administrator, fireproof and safe storage of money and records, storage of office supplies, the use of duplicating and other office machines, and conference rooms. A large vault is not considered necessary for elementary schools nor is it essential in most high schools.

Teachers' Areas: Careful consideration must be given to the provision of suitable workrooms and rest rooms for teachers to use in their free

** The intent of this regulation is to permit an inspection before duct work and primary heating, plumbing or electrical lines are covered up.

periods. Even the smallest schools should contain a general teachers' rest room with comfortable seating and adjoining toilet rooms with entrances other than from the main lounge. Larger schools may require more than one such area.

In all high schools and some elementary schools, there is also a need for offices or workrooms and conference rooms where teachers can prepare as individuals or in groups for their classroom assignments. These areas should be provided with individual study desks, tables and chairs for group work, a professional library of books and magazines, a bulletin board, typewriters, a duplicating machine and other equipment required by the type of program being conducted.

In large elementary schools and all high schools, teachers should be provided with an attractively designed and furnished private dining room where they can relax in an adult atmosphere for a few minutes during their lunch hour.

All teachers' rooms should be well ventilated. Teachers' rest rooms should be provided with a small kitchenette unit where coffee and light snacks may be prepared.

Storage Areas: Most schools of the past have not been provided with adequate storage spaces. In order to rectify this situation, careful study should be given to the requirements of each of the school's departments. The Department of Education publishes special bulletins relating to the planning of various specialized facilities in the high school in particular. These bulletins are very helpful in planning for adequate storage spaces.

Chalkboards: Several new types of chalkboards are available in a variety of colors and, because of their higher reflection factors, are replacing slate boards in most schools. If magnetized teaching devices can be used to advantage in certain instructional rooms steel chalkboards may be desirable. Recent experiments have revealed that in many cases chalkboards which were mounted low enough for pupils to use were not high enough for pupils to see items which the teacher had written on the board. To remedy this situation, the best solution is to use chalkboard sections which are easily adjustable in height. If budgetary requirements make this impossible it is suggested that the top of the fixed chalkboard be located as high as possible and still be within the reach of the teacher.

The recommended heights from the floor to the chalk rail are: 26″ for kindergarten, 28″ for grades one to three, 30″ for grades four to six, 32″ to 34″ for grades seven to nine, and 34″ to 38″ for grades ten to twelve.

The top of all fixed chalkboard sections should be provided with a tack strip and map rail.

Display Boards: Two types of display boards are considered desirable

for most classroom situations: tackboards for displaying two-dimensional materials and pegboards for exhibiting three-dimensional items. All such boards should be located at heights appropriate to the ages of the children being served. In some instances, they may extend from the baseboard to the top of the reach of the teacher—or even to the ceiling.

Display Cases: In past years, school display cases were primarily used for the purpose of exhibiting the school's athletic memorabilia. While this is still important from a morale standpoint, current educational philosophy dictates that more display cases be provided and that they be located where they can be used to display educational exhibits or student projects. Many elementary schools contain a display case in every classroom and located in the corridor wall so that it can be viewed from the corridor as well as the classroom.

Floor Materials: The most commonly used materials for general instructional rooms are asphalt tile, vinyl asbestos tile and vinyl tile. For corridor floors, terrazzo is an excellent material to consider in addition to the above three types of tiles. Wood floors are recommended for woodworking shops and similar areas. Toilet room floors should be of ceramic tile. Care should be taken to select floor materials which will be durable and easy to maintain. A higher cost of initial installation is usually justified by lower maintenance costs.

In recent years, the use of carpeting for classroom and other school areas has been tried in a number of schools and found to be very satisfactory. Although the original installation cost is high, the cost of maintenance has been low and the acoustical properties of the rooms have been considerably improved. The library should be the first room to be considered for carpeting.

Acoustical Treatment: Some kind of acoustical treatment is recommended for all corridors, instructional rooms of all types and cafeterias. The type of material to be used should be suitable to the environment in which it is used. Corridor ceiling applications should be as durable as possible and easily replaced when damaged. Tile used in kitchens should have a surface which is easily cleaned. Carpeting, when used on classroom floors acts as an excellent acoustical material. Selection of furniture with glides designed to prevent disturbing vibration and scraping noises will help to control noises at the point of origin.

Locks: All locks installed in school buildings should be masterkeyed according to a carefully planned program which allows for future additions or modifications.

Internal Partitions: With the exception of corridor walls, internal partitions should be non-bearing so as to permit the maximum degree of flexibility in relocating room dividers. Where team-teaching or instruc-

tional groups of various sizes are to be used, there are a number of different types of operable walls which can be suitably employed as classroom dividers. Such walls should have the ability to reduce the noise transmission between the areas being divided. A rating of at least 40 decibles is suggested as a minimum for classroom areas. Especially noisy areas may require a higher rating.

Number of Stories: In general, it is recommended that for reasons of safety and educational usefulness all school buildings should be designed with the smallest practicable number of stories. Except in large cities where land is not available, all elementary schools should be constructed with only one floor. Because of their size, large high schools may require areas with more than one story. More than two stories is only recommended for very large schools where the site is limited.

No research is available to indicate conclusively that either one-story or multi-story buildings are less costly to construct.

School-Community Use: Experience has shown that combined use of school buildings by school and community groups leads to many problems. Where such use is envisioned, special provisions for such use should be incorporated into the design of the plant. Metal corridor gates, recessed in the wall when not needed, are helpful in separating the areas frequently used by the community from the other parts of the building. Such gates must be so located as to provide sufficient exits to meet requirements for the maximum occupancy of the enclosed area. It is also desirable to provide separate storage spaces for materials and equipment. Special gymnasium lockers are not usually necessary unless there are not adequate lockers available in the regular pupil locker rooms.

Interior Finishes and Color Selections: The selection of interior finish materials and colors is one of the most important aspects of school plant planning and yet one which is often neglected. Care should be taken that a balance is maintained between serviceability and beauty. The school building is home to the pupil for almost half of his conscious hours and the school atmosphere should therefore be as pleasing as possible. A variety of colors and textures is needed in all schools. While classrooms require a reasonably quiet color scheme, there is still room for a variety of color schemes in these instructional areas, and the corridors, lobby, cafeteria and other public areas offer many opportunities to introduce more livley colors into the overall scheme. Corridors in particular require special attention to reduce the long tunnel effect common to many large schools.

2. Elementary Schools

Self-Contained Classrooms: Most elementary schools for grades kindergarten through six are planned around a self-contained classroom which is designed to contain or facilitate almost all normal classroom activities of the pupils in the room. Considerable attention needs to be given,

therefore, to the design of these rooms. Each room should be provided with the following types of equipment: student wardrobes (unless corridor lockers are used), teacher's wardrobe, filing cabinet, storage cabinets, book shelves and/or carts, sink cabinet with drinking fountain, work counters and movable classroom furniture of various types which will facilitate both individual and group work. Special equipment is also desirable for specially planned areas such as library, art, science and music centers.

The amount of chalkboard and tackboard in each room should vary depending on the grade level and the instructional methods used. Movable sections 4'0" in width provide the maximum in flexibility but usually cost more than the fixed-type boards.

All rooms should be equipped for the use of visual and auditory aids with adequate electric outlets, room darkening devices, projection screens and map display rails.

There is little agreement on the question of which storage units should be built-in and which should be portable. There seems to be some merit however in being able to move storage units about the room to form temporary partially divided areas for special individual or group activities, and it is likely that these activities will increase in future years.

Auxiliary Spaces: A good elementary school must contain much more than self-contained classrooms. Some of the auxiliary spaces which are normally provided in a good elementary school are: general office, principal's office, conference room, nurse's suite with examination room, rest area, and toilet room, remedial room, library with office-workroom, cafeteria and allied preparation areas, gymnasium or playroom, auditorium or stage in a multi-purpose room, teacher's lounge and toilet facilities, one or more activities rooms for special instruction or group work in fields such as music, shop, fine arts, home economics and science.

Corridor Lockers: Corridor lockers are recommended for upper elementary school classrooms since their use will free one additional wall for display or other use and permit more flexible utilization of the space in the classroom. Locks may not be required at this grade level, however, when used, separate master-keyed combination locks are usually preferred.

Playground Toilet Facilities: It is desirable to provide an outside entrance from the playground to at least one toilet room for each sex. It should be possible to isolate these rooms from the main building if they are to be used for summer playground activities.

Multi-Purpose Rooms: The use of movable walls to divide secondary school gymnasiums is now commonplace. Experience has shown that many elementary schools can also benefit from the use of such movable partitions in the multi-purpose room. This is especially useful if the room is designed as both a cafeteria and play room.

The ceiling height of the multi-purpose room should be appropriate to the grade levels involved, the type of activities anticipated and the size of the room. A ceiling height of 12 feet would be the bare minimum and would not permit many games commonly played in elementary schools. If basketball and other active games are to be included in the program, a ceiling height of 18 feet is adequate for elementary school purposes.

Classroom Exterior Doors: When funds permit, it is desirable to provide exterior doors for all elementary school classrooms so that pupils may have direct access to the playground or outside instructional areas. This is especially important for the kindergarten and primary grades.

Playground: Separate play areas are recommended for the kindergarten, primary and intermediate grades. Some paved area should be available for each level. All apparatus should be selected with three basic things in mind: (1) Is it safe under normal use? (2) Is it appropriate for the age levels involved? (3) Does it serve an educational function?

3. Secondary Schools

Student Activities Spaces: Careful planning is required to provide spaces for extra-curricular activities for various types including, but not limited to, the following: school newspaper, yearbook or other similar publications, school bank, school store, ticket sales, student government and clubs.

Stage: A stage depth of not less than 25 feet is desirable for all high school aduitoriums. Ample off-stage space, not including dressing rooms and other auxiliary rooms should always be provided. Both sides of the stage should be accessible from backstage.

Science Rooms: Wherever possible separate science rooms should be provided for each of the major sciences. When this is not possible because of limited enrollment, special care needs to be given to the design of the room layout and equipment design so that the design is suitable for all subject matter to be covered. Separate storage areas for chemistry and physics are always required to prevent damage to the delicate physics apparatus by chemical fumes.

Combination lecture-laboratory rooms are preferred for all science activities. Separate classrooms and laboratories are not desirable. Equipment needs must be carefully studied and made a part of the planning process because of the necessity for properly locating utility connections and drainage lines.

Provisions for individual research should be made in the science suite. Such facilities should be located where students can work with indirect supervision from faculty members occupied with other primary teaching responsibilities.

Gymnasium: The ceiling height for a secondary school gymnasium should be approximately 20 to 22 feet. Folding bleachers are considered the most practical way to provide maximum seating capacity for athletic and other similar events and still free most of the floor area for physical education classes. Overhanging balconies are never recommended.

4. Electrical

Intercommunication System: All high schools and most large elementary schools should be equipped with an intercommunication system which has adequate flexibility to enable its use as a teaching device. This system should be designed to provide broadcast listening on both the AM and FM frequencies, pickup and broadcasting of special school programs or events including the ability to record and play back at a later time. The location of the central control panel is especially important. To assure privacy many school administrators prefer to have a separate telephone system. Microphone outlets should be provided at such locations as the gymnasium, auditorium, lunchroom, bus-loading platform, athletic field and playground.

Educational Television and Radio: The use of television as an education tool has increased gradually in recent years and will probably increase more rapidly in the years to come. Consideration should thus be given to the provision of a central television antenna with service outlets run to each instructional room. Consideration should also be given to the possible installation of an AM and FM radio antenna with service outlets in each classroom.

5. Sanitation and Plumbing

Toilet Room Shelves: Main toilet rooms in junior and senior high schools should be provided with shelves about 10″ wide for students to place books and other possessions while using the facilities. In girls' rooms these shelves can double as a makeup counter if located under the mirror.

Individual Toilet Rooms: Individual toilet rooms are recommended for all classrooms serving grades one through three.

Public Toilet Rooms: The auditorium, gymnasium and other areas normally occupied by large numbers of visitors should have adequate toilet rooms located conveniently to the principal entrances or lobbies. A considerable saving in construction cost can often be achieved by locating general pupil toilet rooms so as to serve these areas as well as classroom areas.

Shower Rooms: Gang showers are recommended for boys. There is a trend toward gang showers for girls, with several individual showers and adjoining dressing cubicles. Each community should decide the type of

showers to provide for girls in terms of local custom and desires. All shower rooms should have some provision for liquid or bar soap.

Towel Service: Many schools have found it advisable to provide a towel service so that each pupil may obtain a clean towel for each shower. Some schools do their own laundering in order to provide the service most economically.

Insect-Screens: Insect-screens should be provided for all windows and exterior doors in the lunchroom, kitchen and related areas, home economics cooking rooms, biology room and other areas which tend to attract flies.

Kitchen Employees: Kitchen employees should be provided with a toilet and dressing room with lockers and showers. These rooms should be near to but not opening directly into the kitchen.

Classroom Drinking Fountains: A desirable feature of every elementary classroom is a drinking fountain, which may be attached to the classroom sink.

Drinking Fountains: Whenever the budget permits, it is recommended that electrically cooled drinking fountains be used for all those located in corridors or other public areas. Outside drinking fountains should be located convenient to a pupil playground or athletic areas and any other areas where large numbers of pupils may congregate.

Swimming Pool: A swimming pool is a most valuable adjunct to a modern health and physical education program.

Gym Lockers: Every pupil should be provided with a small locker for the storage of his gym clothes and in addition there should be enough large lockers for the maximum number of pupils who might use the gym at any one time. Special gym lockers are usually provided for one or more varsity sports programs.

Toilet Seat Heights: Advisable heights for toilet seats for kindergarten children are 10″ (baby size); for grades one through six, 13″ (junior size); and for grades seven through twelve and adults 15″ (standard size).

Plumbing Economies: Where economy is essential, consideration may be given to the following:

a. The elimination of separate shut-off valves on cold and hot water lines to each wash basin, and the adoption of one cold water and one hot water shut-off valve for the entire group of wash basins in each toilet room or pair of rooms.

b. The installation of multi-pupil wash basins which require only one set of plumbing connections.

6. Fire Safety

Stage curtains and draperies should be permanently flameproofed. When the stage is equipped to fly scenery, an automatic sprinkler system connected to the automatic fire detection system is desirable.

Physically Handicapped: Consideration should be given to the growing use of schools by pupils who are physically handicapped by orthopedic defects, cardiac disorder, and other physical disabilities. The presence of an entrance which permits easy access to the building from the ground level or the availability of an elevator in a multistory building may often be the controlling condition which permits such pupils to continue attending school.

7. Ventilation Economies

Where economy is essential consideration may be given to the following:

a. Make-up air for gymnasium locker rooms may be provided entirely or in part by pulling exhaust air from the gymnasium proper.

b. Make-up air for cafeteria kitchens may be provided entirely or in part by pulling exhaust air from the main cafeteria.

SELECTING A DESIRABLE SCHOOL SITE

School sites should be selected well in advance of actual needs. The selection of a site for a school building involves technical problems and educational factors which requires the co-operative efforts of the professional parties concerned. Suggestions for selecting a school site must be sufficiently broad and flexible to allow for variations in the character of the school district in which the site is located, the size and type of school to be built, and in the nature of the educational program and activities to be accommodated.

It is recommended that consideration be given to the following factors in site selection: size and shape, topography, accessibility, environment, safety, health of pupils and school personnel, accessibility of public utilities and services, surface and sub-surface conditions, the orientation of projected building on the site, initial cost and development cost and the over-all master plan for schools in the district.

Before any action is taken to purchase or otherwise acquire sites intended for future schools or school expansion, it is strongly recommended that the consultative services of the Bureau of School Building Services in the State Department of Education be requested. Within

practical limitations of staff, the Bureau will assist in evaluating sites for school districts. Approval by the Bureau Consultants will signify to the board of education that an astute investigation and the careful weighing of a number of factors have been made in approving the prospective school site. This approval will do much to create a favorable reaction among voters when a referendum is required. By virtue of specialized training and wide experience, there are other persons particularly knowledgeable in the field of site selection who may be called upon for expert assistance. These advisory services should be utilized in selecting a suitable setting for the school plant.

A. Size of Site

The size of any school site should be determined largely by the nature and scope of the contemplated educational program. Actual layouts of the spaces needed by the various phases of the program should be made. Because the site-size problem varies in accordance with the needs of the type of school organization and in terms of the age and development status of the community or school district, the following rules must be taken as *minimums* for which all should strive and which most should exceed.

1. Elementary Schools (K-6). It is suggested that there be provided a minimum site of five acres plus an additional acre for each 100 pupils of predicted ultimate maximum enrollment. *Example:* An elementary school of 500 pupils would have a site of ten acres.

2. Junior High Schools (Grades 7, 8, 9). It is suggested that there be provided a minimum site of 20 acres plus an additional acre for each 100 pupils of predicted ultimate maximum enrollment. *Example:* A junior high school of 500 pupils would have a site of 25 acres.

3. Senior High Schools (Grades 9-12). It is suggested that there be provided a minimum site of 30 acres plus an additional acre for each 100 pupils of predicted ultimate maximum enrollment. *Example:* A senior high school of 1,000 pupils would have a site of 40 acres.

Larger school sites have become necessary for a variety of reasons. On-the-site parking for pupils, faculty and the public have made increased demands on school space. Growing communities, which have not been able to make provision for adequate parks and recreation areas for the public, have found it both desirable and economical to combine public recreational and school recreational areas. Where public park land adjoins a public school site, it should be made suitable for and available to the school for its use in its out-of-doors program. Sometimes schools and communities jointly plan school and community libraries, health

clinics and adult education facilities to get the maximum use of a site.

The growing popularity of one-story schools in place of multi-storied structures makes its demand upon space, as does also the pressing realization that future additions to the building will probably be necessary in the not-far-distant future. It is true, too, that some schools like to have adequate space for school gardens and an agricultural demonstration area, and rate highly their educational values. The trend for providing space for a great variety of outdoor teaching areas necessitates larger sites. Larger sites result in substantial improvements in educational programs, community services and efficiency of operation.

Experience has indicated that ultimate site requirements should be met with the initial site acquisition because land adjacent to a new school soon becomes occupied with housing developments.

Almost all suburban communities are burgeoning in population. Their possible destinies, in point of future population are only vaguely felt and very dimly perceived. A small restricted school site, a few years hence, is likely to prove a ponderous obstacle to adjustment to new conditions, and may prove to be one of the most compelling factors in the creation of a "blighted" district. A large school site has always the opposite effect.

Even for small schools a large site is essential. Actually, for many activities such as baseball, tennis, track, soccer and football, the same space needs are felt by both large and small schools.

The shape of a site should be measured in terms of the probable functional requirements of its use. Ordinarily, satisfactory arrangements can be achieved on a rectangular site with dimensions in a ratio of approximately three to five. It is possible, however, to secure suitable arrangements on irregularly shaped sites through appropriate building design and placement. The site should have sufficient frontage, however, to permit a proper design with adequate walks and driveways.

B. Topography of Site

Fine grounds embellish and provide an appropriate setting for a fine school building. A natural elevation with satisfactory approaches for avoiding long or difficult climbs make a desirable setting. The site should be free from drainage from contiguous territory and should permit proper drainage throughout at a reasonable cost. Rapid drainage and quick drying should characterize the parts of the plot which are expected to serve as recreational and play areas. A clay subsoil is not considered to be as satisfactory as sandy loam fertile enough to produce good lawns and vigorous landscaping. Topography is of necessity related to size of site. If, because of topography, portions of a site are unusable for certain necessary purposes, the total amount of land needed for a school must be reconsidered.

C. Accessibility of Site

Schools should usually be located near the center of the present and the probable future school population which is to be served. Yet there are exceptions to this rule-of-thumb. Like the large super-markets, schools are finding that a large fine site, perhaps removed from the center of population, is preferable to a small restricted site more centrally located. In other words, the amount of good space available is frequently a more compelling cause for site selection than is central location. The increasing ease of transportation tends to nullify the initial advantages of a centrally located site. In this case safety and convenience of approach are of greater relative importance.

Where transportation is involved, the maximum travel time for elementary pupils should rarely exceed thirty minutes and for secondary pupils one hour. Special paths for bicyclists should be planned, with covered racks for the vehicles.

D. Environment of Site

Most school grounds are planned to contain lawns, foundation plants to "tie" the buildings to the ground, hardy shrubs placed at the angles and curves of drives and walks, tall trees to frame the building, and trees planted in groves for shade. Among the common classes of plants used are shade trees, smaller ornamental trees, coniferous evergreens, broad-leafed evergreen shrubs, deciduous flowering shrubs, vines, and ground covers. Whatever is planted should be grouped with respect to height, color, and cultivation requirements.

Because attractive physical surroundings have an especially strong influence on youth, the environment of a school site is a very important factor. The activities conducted within a school call for quiet surroundings, clean fresh air, abundant sunshine, and freedom from disturbing noises and the turmoil of crowded neighborhoods. It is unquestionably true that the wholesome cheerfulness and beauty of the school site will pervade the entire school and be reflected in countless ways in the attitudes and work of the pupils. Isolation from undesirable commercial enterprises should be sought. If possible, close proximity to sanitariums and hospitals should be avoided. Resourceful treatment of landscaping can usually minimize the disfiguring effects of such essential but unsightly facilities as parking areas, service drives, and refuse-disposal units.

If community recreational use is planned, consideration should be given to setting aside a special area for picnic tables and fireplaces.

E. Safety Conditions of Site

A major objective in selecting a site is to provide conditions conducive

to the safety of children. The location of the building on the site should permit children to pass through a safety zone before being confronted by traffic dangers. If at all possible, children should not be forced, by the location of the school, to cross railroads, automobile speedways, or heavy traffic lines. The site should be free from fire, water, or land hazards. Automobile roads within the site should be constructed to accommodate one-way traffic only, with proper signs indicating clearly their directional use. Where buses are used for transportation, careful consideration should be given to the loading and unloading facilities, to achieve the maximum of safety for the children. Parking space should be provided properly related to school use. If possible, a separate parking space for school visitors, located near the main entrance, should be provided. Dividends will accrue when parking facilities used for evening functions are amply lighted.

It is frequently advisable, also, especially in elementary schools, to provide special playground areas for children in the lower grades.

F. Health of Pupils and School Personnel

Since the building in its environment is expected to be a healthful place for human beings to live, work, and mature, there should be present no factor that will interfere with the natural lighting of the rooms, nor should the site suffer from odors, dust, or polluted air blown from industrial centers, streets, or unfinished playgrounds.

G. Accessibility to Public Utilities and Services

Economy, as well as convenience and efficiency, would dictate that inexpensive access to gas, water, sewer, electric, and telephone service be considered in acquiring a site. Since it is recommended that all public utility services be placed underground, it can readily be seen that extensive pipelaying and wiring, connected with distant points, would involve large financial expenditures. When site facilities are planned, consideration should be given to outdoor drinking fountains, hose connections near the various courts and playing fields, and lights for courts, playground areas, driveways and parking plots. A desirable feature in selecting a site would be to choose one near a source of public fire protection.

H. Surface and Sub-surface Conditions

Minor shortcomings in an otherwise excellent site, occasional surface unevenness or rock out-croppings, need not count too heavily. These flaws may often be easily corrected, or better, turned to advantageous use.

Adverse subsoil conditions such as rock, poor bearing soils, high water levels and soils impervious to water will usually cause difficulties and

increase costs. Difficult site contours may cause substantial extra expense. Obviously, a site should not be seriously considered for a school building unless these matters have been investigated and no building should be designed before its proposed location has been subjected to a thorough subsurface inspection by borings or other means acceptable to those responsible for design success.

Sites minus proximate public utilities should first be taken on an option which permits the privilege to drill for a potential water supply, and, at the same time, to test the overburden for percolation referenced to the requirements of the State Board of Health. A very expensive error can be made in failing to obtain a site from which potable water may be derived and into which the effluent from approved sewage treatment facilities may be discharged.

I. Orientation of the Building on the Site

It is advisable to locate the building on the site in such a way as to permit the maximum use of the light area and to allow for possible future additions. For unilateral lighting it is more important to orient the building to provide the best seeing conditions in the classroom than to locate it with regard to the axis of roads, streets, or other physical features. East and west exposures for the majority of the rooms are generally considered most satisfactory. Because the best orientation is that which avoids morning or late afternoon sun at right angles to the classroom, it is desirable that the building be built to face slightly south of east and north of west.

Although schools have a reasonable set-back from the street line, for both safety and attractiveness, the utility of the site should not be sacrificed just for beauty. Schools with long beautiful approaches, set in the center of their site, usually constrict the amount of space that should be used for essential physical education and recreational purposes. The development of the various areas for these activities should be in proper relationship to the buildings on the site. It is also important that the building be placed so as to take full advantage of planned contours of the site.

J. Initial Cost and Development Cost

The cost of land is quite low in comparison with the structures and other improvements erected on school sites. A poorly-suited parcel of land will seriously restrict possible development and may increase building costs to a marked degree. Therefore, careful evaluation and wise

selection among sites available are important steps in securing maximum value for project funds.

Site costs really include both purchase price and development cost. Both are seriously considered in any realistic site evaluation. In comparing possible sites, initial cost alone can lead to serious delusion. It is particularly at this point that the architect can be so valuable. A cost comparison table should be prepared for each of the favored sites being considered, listing besides initial costs, estimates of the costs for:

Clearing and Grubbing
Demolition and Removals
Earthmoving
Rock Removal
Underdrainage
Electrical Service
Athletic, other facilities
Engineering, boring, subsoil analysis
Storm Drainage
Water Supply
Sewage Disposal
Walks, Drives and Paving
Sodding, topsoiling and Planting
Fencing, Gates, Barriers
Transportation cost differences

The total of these costs with the cost of acquisition will give a reasonably close picture of the true site costs involved and a more rational basis for choice.

K. Consideration of Area Master Plans

Ideally, site acquisition is planned for several years in advance of need, as a responsibility of the local board of education. Careful studies should be made of population trends, industrial, commercial and residential developments and other factors indicative of when and where new school sites will be required.

Community and regional master-plans where existing should be reviewed for their probable influence on the future of the local school system. Land use maps are most frequently found where there is community planning and urban redevelopment. Such maps can provide much valuable information. Geodetic and soils survey maps are available and are most useful in preliminary study of prospective sites. Other sources of basic information to be consulted in wise planning would include: pupil enrollment forecasts by the school administration or other experts, utility company studies, realtor and developers activities, aerial photographs, highway maps, reports of various land use specialists, preschool or pupil spot maps and dwelling unit maps. The nature of the local situation will govern the choice of devices or procedures to be used.

Boards of Education are required to submit a copy of its plans to the local planning board for review in those municipalities where such agencies have been established.

THE MODERNIZATION OF EXISTING SCHOOLS

Almost as urgent as the construction of new school buildings in New Jersey is the renovation, rehabilitation, and modernization of some of our existing school plants. Alterations in present facilities are least effective when haphazardly made; they are most effective when they are part of a carefully planned program of improvement.

Many school buildings of necessity have been continued in use, even after they have approached obsolescence. Because boards of education have desired not to spend too much money on such old buildings, repairs and maintenance costs have been pared to the minimum. In many instances safety conditions have grown increasingly worse, often aggravated by the non-fireproof interior construction of the buildings.

In such buildings it is not uncommon to find ancient toilet installations located in the basement; heating plants operating ineffectively on borrowed time; improper and inadequate lighting reduced to its lowest possible factor by dingy walls, somber ceilings, and dark woodwork; classroom facilities insufficient to meet pupil and teacher needs in today's educational program; and unimproved school sites deficient in provisions for proper outdoor activities. The health, safety, and comfort of pupils housed in such buildings merit the sincere attention of boards of education.

In many older buildings, programs involving major improvements can be undertaken, and will prove both advantageous and economical. Even a minor improvement program, possible in any building, will produce astounding benefits to pupils, teachers, and community. Interiors can be painted to develop the maximum reflection values of walls and ceilings. Artificial lighting can be improved, by the installation of better fixtures and raising the wattage. A better visual environment is easily obtained even in the oldest buildings, and will pay dividends in the protection of children's vision.

It is neither necessary nor advisable for boards of education to postpone improvement programs until their resources permit them to embark upon the construction of new buildings. A planned survey of existing conditions will realistically approach the problem of providing better opportunities for those pupils whose education is at present sorely handicapped by obsolete facilities. The rejuvenation of existing school plants is often the first step that should be taken to protect the safety, sight, health, and comfort of pupils.

It is the policy of the Bureau of School Building Services to review final plans for alteration work as soon after receipt of the plans as possible. However, boards of education and architects are urged to submit plans for such alteration work as far in advance as possible in order to properly

schedule actual construction during periods when the school building may not be occupied.

BUILDING SCHOOLS TO FIT PROGRAMS

A school building is erected to house an educational program, and therefore, should be planned from the inside out. The school plant should be considered an instrument of great value in furthering, facilitating, and making effective the type of educational program desired by the community.

The first task facing a school system considering new school construction is to decide what grades, classes, and courses should be taught, what the curriculum content should be, and what basic educational methods should be encouraged. Underlying such decisions, of course, will be the philosophy of education, especially in respect to aims and purposes, accepted as desirable by the community.

To be able to plan intelligently a school building today, the persons responsible for planning should be cognizant of such points of view as the following, which have received wide-spread acceptance:

1. The schoolhouse is a place for many kinds of learning. No longer is the mastery of the three R's the only objective sought. Every member of a school staff is expected to help guide pupils toward the attainment of a wide variety of objectives, each of which has a part in the development of a wholesome, effective, and well-rounded personality.
2. The schoolhouse itself can help teach children an appreciation of beauty, the orderly usefulness of space, the profitable interrelationships of parts, and the spirit of harmonious living.
3. A school building should be a place that will help children grow to their best, physically as well as mentally. Their sight, posture, nutrition, and every bodily process should be helped toward the ideal by the conditions of life at school.
4. School buildings should serve not only pupils and teachers, but also the community which provides the school.
5. Classes should not average more than twenty-five pupils, if the community hopes to provide an educational program fitted to the individual needs of children and to achieve a wide horizon of objectives. Children differ greatly in abilities, attitudes, needs, and other characteristics, and teachers cannot adapt instruction to all the children unless class size is limited.
6. Classrooms and all instructional areas including spaces for both large and small group activities should be designed and equipped to provide the conditions under which children learn best. It is

now known that children do not learn best when they sit, silent and unmoving, at a desk, with a book before them. They learn best when they work in a classroom designed as a laboratory for purposeful group planning, group activities, individual study and research, class discussion and evaluation. The new classrooms, therefore, are provided with maps, globes, radio, record player, television receiver, library corner, bookcases, encyclopedias, work bench, art easels, running water, storage for supplies, and movable desks and tables. Such learning laboratories, although housing fewer pupils, require larger floor areas than the learning program of former eras.

7. Larger buildings, serving larger areas, together with a realization of the need for nutrition education, have made advisable the inclusion of kitchens and lunchrooms in both elementary and high schools.

8. A modern program of education has come to need gymnasiums together with related facilities such as dressing rooms, lockers, and showers in all except the very small elementary schools.

9. A spacious, well-stocked and well staffed library is as necessary for the elementary school as the high school. Young children need lots of books, books to fit every level, every interest and every area of the curriculum and other materials.

10. The music program in good schools, once limited to classroom choral work, now emphasizes bands, orchestras, a variety of choral groups, and individual instrumental work.

11. Sites for elementary and high schools are increasing in size, thus forcing school boards to acquire larger acreages. Such sites often provide play areas which are adapted to community and adult use in evenings, on Saturdays, and in vacation periods.

12. Emphasis is being put on more adequate storage for the many materials needed for a good school program.

13. Teachers and custodial employees should be brought early and continuously into the planning of the building, and should be encouraged to present suggestions for consideration. Pupils and citizens should participate also.

14. Every new building should possess possibilities for expansion to a recommended maximum capacity.

In the planning of buildings, trends in educational organization, programs of instruction, and teaching methods are very worthy of serious consideration, since a school plant is built to serve not only the needs of today, but the needs of the future.

A well-planned school building will reflect thoughtful consideration of the:

1. Orientation of classrooms to obtain the best and most easily controlled daylight.
2. Various sizes and shapes of rooms to fit the types of instruction and activity carried on in those rooms.
3. Reduction of traffic on stairs and in corridors for pupils and materials.
4. Provisions for orderly pupil traffic flow with a minimum of congestion.
5. Relationship of classroom and service facilities to make coordination more effective and to minimize student traffic.
6. Attempt to keep as much as possible of the school site area available for playground and outdoor educational purposes.
7. Shielding of such work areas as the library and classrooms from noise-producing activities carried on in rooms for choruses, band and orchestra, gymnasium, shop, and playground.
8. Protection of class, study, and assembly groups from the disturbing odors of laboratories and kitchens.
9. Construction materials used, the potential financial ability of the district, the community being served, the safety of the pupils, maintenance costs, and beauty.
10. Location of entrances easily available to persons who walk, come by bus, or come by automobile.
11. Pupil safety in approaching and leaving the building.
12. Health, safety, comfort, and efficiency factors, applicable to both pupil population and employed personnel.
13. Provisions for parking facilities for pupils, teachers, visitors and community.
14. Flexibility of the building to permit reorganization of space to fit changing concepts of education and changing needs of the pupil population.
15. Possibilities of community use of the school facilities.

STATE BOARD RULES

GOVERNING SCHOOLHOUSE CONSTRUCTION

Pursuant to R. S. 18:2-4

The following regulations adopted by the State Board of Education in order that the lives, health, sight, and comfort of pupils may be properly protected shall apply to the erection, construction, reconstruction, and alteration of any public school building or addition thereto.

I. POLICY, SERVICES, AND PROCEDURE RELATING TO PLAN PREPARATION, FILING AND APPROVAL

A. Policies and Services

1. The object of the *Guide for Schoolhouse Planning and Construction* is to further the interests of the public schools of New Jersey by making the school buildings of the State healthful and safe, while at the same time preventing extravagance or wastefulness in their construction. The State Board of Education cordially invites suggestions from educators, local boards, architects, and other citizens, in improving the provisions of the *Guide*.

2. The approval of the plans and specifications is limited to the various matters mentioned as prescribed in the specific requirements of the *Guide* and does not contemplate the endorsement of any particular kind of materials, apparatus, mechanical equipment, or any special devices which may be mentioned in the specifications or shown on the plans.

3. No responsibility is assumed by the State Board of Education for the structural features of the building, the efficiency of the mechanical equipment, the grade of materials, or the quality of fixtures which are to be installed.

4. The principal function of the State Department of Education is that of service rather than regulation. The State Department of Education welcomes the opportunity to give all possible assistance, including consultative service, to those asking advice about the erection of new school buildings or the remodelling of existing schools, or in school planning as the demands upon its staff permit.

5. The regulations and requirements contained herein shall apply to every new public school building within the State and to all modifications to any existing school building involving additions, alterations, or reconstruction. Alterations to existing buildings shall comply with the *Guide* as far as practicable.

6. The definitions of new buildings and existing buildings shall be understood to be as follows:

   a. New buildings shall mean and include any building or unit of a building in which the entire work is new, or an entirely new addition connected to an existing building or any existing structure proposed to be remodelled or enlarged by building into it fifty per cent or more of new work based on the square foot area.

b. Existing building shall mean and include all buildings erected, remodelled, or enlarged, prior to publication of the *Guide*, or to buildings remodelled or enlarged after publication of the *Guide*, provided that less than fifty per cent of the floor area of the remodelled or enlarged building is new work.

c. Any changes to existing construction, necessitated by any remodelling or repairs, shall conform to the requirements as set forth. When existing schoolhouses are enlarged, these provisions shall apply only to the added portion or portions. It is recommended, however, that the old portions of such buildings shall be made to conform to the provisions of the *Guide* as far as practicable.

7. Boards of education may not make physical changes effecting the plan or the construction and utilities of a public school building without first having plans prepared and submitted to the State Board of Education for review and approval. Plans and specifications for repair or replacement work which constitute a change in design, layout or use of facilities as originally approved shall also be submitted for approval by the State Board of Education.

B. Approval and Filing of Plans and Contracts

1. No contract for the erection of any public school building or any part thereof shall be made until and after plans and specifications therefor have been submitted to and approved by the State Board of Education. A copy of the plans and specifications as approved shall be filed forthwith with the State Board of Education. (18:11–8)

2. No change in the plans or specifications shall be legal unless the same have been submitted to and approved by the State Board. A copy of all changes as approved shall be filed forthwith with the said Board. (18:11–8)

3. A copy of the contracts for the erection of the whole or any part of the school building and for the furnishing thereof shall be filed with the State Board of Education within ten days after the same have been signed. (18:11–9)

   NOTE: The contracts shall be filed by the secretary of the board of education.

4. No board of education of any school district nor any board of education of a county vocational school shall be required to secure the approval of its plans and specifications for the erection or alteration of any school building or vocational school building or any part thereof by the municipality therein, nor shall any board of education or any board of education of a county vocational school

or any contractor doing work in connection with school buildings or county vocational school buildings be required to secure a building permit from the municipality. (Revised Statutes 18:11–11, as amended P. L. 1948, c. 56, p. 144)

5. In the preparation of plans and specifications for the erection, construction, alteration, or repair of a public school building, when the entire cost of the work will exceed one thousand dollars in amount, the architect, engineer or other person preparing such plans and specifications, shall prepare separate plans and specifications for the plumbing and gas fitting, and all work kindred thereto, and of the steam and hot water heating and ventilation apparatus, steam power plant and all work kindred thereto, and electrical work, structural steel and ornamental iron work. (18:11–7)

6. In the erection, construction, alteration, or repair of a public school building, when the entire cost of the work will exceed two thousand dollars in amount, the Board of Education shall, in the manner provided by law, advertise for and receive separate bids for the plumbing and gas fitting and all work kindred thereto, the steam and hot water heating and ventilating apparatus, steam power plant and all work kindred thereto, and electrical work, structural steel and ornamental iron work. The Board shall award contracts for such work to the lowest responsible bidder for each of such branches respectively. (18:11–10)

7. No contract for the building of a new schoolhouse or for the enlargement of an existing schoolhouse shall be entered into without first advertising for proposals therefor. No contract for repairing of an existing schoolhouse at a cost of more than two thousand dollars shall be entered into without first advertising for proposals therefor. The advertisements required by this section shall be made under such regulations as the board may prescribe. (18:6–25 as amended P. L. 1957, c. 174) No board of education shall advertise for bids until the Director of School Building Services informs the same that he is recommending approval of plans and specifications to the State Board of Education.

8. No bid for building or repairing schoolhouses or for supplies shall be accepted which does not conform to the specifications furnished therefor, and all contracts shall be awarded to the lowest responsible bidder. (18:6–26)

9. Every board of education shall require that all persons proposing to bid on any contract with the board for public work shall first be classified by the State Board of Education as to the character and amount of public work on which they shall be qualified to submit bids. So long as such requirement is in effect, the board of education shall accept bids only from persons qualified in accordance with such classification. (18:11–9.2)

C. Application and Conditions for Approval of Plans and Specifications

1. All plans and specifications for school building work of any nature must be prepared by an architect registered to practice in this State or by a consulting mechanical or structural engineer registered to practice in this State and within the limits covered by such registration.

   Each page of the plans and the title page of the specifications shall bear the signature and embossed seal of the architect and consulting mechanical or structural engineer. The name, signature and embossed seal of the consulting mechanical and/or structural engineer shall be placed on his own plans, if and when such engineer is used.

2. Duplicate copies of all plans and specifications embracing each and every contract shall be submitted, together with duplicate copies of an application for approval.

3. All applications for approval shall be directed to the Secretary of the State Board of Education for the attention of the Director of School Building Services and made upon the official blank form prepared and supplied by him. These forms are furnished upon request of the architect, and it is requested that they be used instead of duplicate copies made by the architect. The application must be signed by the architect, or by the consulting mechanical or structural engineer in the case of specific planning being undertaken in these areas exclusive of other areas, and the president of the board of education. Applications signed by others will not be accepted.

   All information requested on the application for approval must be given and all queries fully answered.

4. Approval by the State Board of Education is valid only for the specific project indicated on the application. Every building project requires separate submission and approval of its plans and specifications. Any changes or revisions to the plans and specifications as approved must be submitted for approval in the same manner as the original submission, as such changes or revisions invalidate the original approval.

5. Approval of plans and specifications shall be held as in effect for a period of one year only after the date of such approval. After this period a renewal of the approval must be secured for the work not under contract.

6. It shall be incumbent on the architect, or on the consulting mechanical or structural engineer for specific areas, to give written notice to the Director of School Building Services at least ten days

before plastering is started or any work is closed in so that an inspection can be scheduled of all work in place and written approval given before proceeding with plastering. Strict attention to this requirement will enable the Department to schedule inspections and expedite approval. Plastering or closing-in may not proceed without written approval.

It is also required that the architect, or the consulting mechanical or structural engineer, advise on the completion of all contracts so that a final inspection may be made.

D. Preliminary Plans

The policy of the State Department of Education is not to accept any schematic or preliminary plans for tentative approval unless the architect submitting the plans has been regularly retained as the architect for the project. Preliminary plans will not be accepted for review and tentative approval until the project has been voted favorably by the public.

Educational needs should determine the plan and design of the school; therefore, before preliminary plans are developed for the project the educational program and accommodations required should be definitely determined by the school board and its staff. The architect can be very helpful to the board and its staff at this stage. However, the architect should not be expected to plan the educational program as well as the building and facilities to carry on the program.

Boards of education will find that the services of a well qualified consultant in school plant planning often will help them to plan buildings which are better adapted to the educational needs of the community. Frequently such consultants are able to indicate more economical ways by which needs may be met. Many times errors, which would have resulted in a less satisfactory building or in increased costs, are thus avoided.

The experience of the State Department of Education indicates that the period of preliminary planning offers fruitful opportunities for its cooperation with architects and boards in the evolution and development of building plans. It is the period in planning when the architect studies and endeavors to solve all the major problems that confront him in determining the overall scheme and layout of planned spaces and use to best meet the needs and functions of the desired educational program. Since final plans are basically a development of the preliminary plans, complete and comprehensive studies are practically essential at this stage of plan-development.

The New Jersey Department of Health should be contacted to assay the problems that may be encountered in providing for sewage disposal and the availability of a satisfactory water supply. Preliminary plans shall

indicate a sewage disposal system that will be approved by the Department of Health.

In order to minimize the amount of revision in the final plans or working drawings, it is required that preliminary plans shall be submitted to and tentatively approved by the State Department of Education before the final plans are started. This permits the Department to review them in the light of requirements and to offer such constructive comments or advice that may be deemed advisable. Preliminary plans submitted for review and tentative approval shall include the following:

1. A plot plan of the school property, drawn to scale, giving overall dimensions, the points of the compass, general topographical conditions, the location of existing structures and their relation to the proposed building, the relation of the school to highways and streets, and such physical features that present any deterents in maintaining adequate protection for the safety, health, sight, or comfort of the pupils. The plot plan may be drawn to any scale, so long as it indicates with clarity the required features.

2. Preliminary floor plans shall be drawn not less than 1/16″ to the foot, giving overall dimensions; the location, size, and intended use of all areas of the plans; the tentative layout of equipment features of special rooms including built-in equipment; future additions; a statement giving general method of heating and ventilating; and a description of the proposed method of lighting all instructional areas. If the proposed building is to have several identical rooms, one such room shall be shown in complete detail as being typical of such identical rooms.

3. There shall be a drawing, using the same scale, of elevations and sections to indicate the finished floor and ceiling levels and their relations to the finished outside grade together with the steps or other features related to the exit facilities.

4. In the case of the addition to any existing building it is required that a floor plan be submitted showing all areas including existing sanitary facilities and exits and any proposed changes therein.

5. There shall be submitted with, or as a part of the preliminary plans, a statement showing:

   a. The grade levels of pupils to be housed in the building.

   b. The planned pupil capacity of the building.

6. Three important practices, followed undeviatingly by the State Department of Education, should be noted by those submitting preliminary plans:

   a. Any preliminary plans not in conformity with the above requirements will be returned without review.

b. Preliminary plans submitted prior to those submitted as the architect's solution of the planning to meet the educational program, or "schematic" plans to indicate general schemes under consideration, will be reviewed when the Department's advice on specific or unusual cases is desired.

c. Prints, preferably black and white to identify preliminary plans from final plans in blueprint form, are required in submitting preliminary plans for review and tentative approval. These should be mailed to the Director of School Building Services, State Department of Education, 225 West State Street, Trenton, New Jersey 08625.

E. Final Plans and Specifications

Final plans and specifications submitted for review and approval by the State Board of Education shall meet the following requirements and shall conform with the best professional practices. They shall show clearly, accurately, and completely information on all phases of the work to be undertaken.

1. Plans and specifications shall be submitted in duplicate, together with an official application for approval properly filled out and signed as required.

2. When the plans and specifications have been reviewed and approval has been granted by the State Board of Education, formal notice will be sent the architect and the Board of Education advising of the approval.

3. One set of the plans and specifications will be retained by the State Department of Education, and the duplicate set, stamped with the State Board of Education's seal of approval, including the official notice of approval signed by the President and Secretary of the State Board, will be forwarded to the secretary of the local board of education. A copy of the official notice of approval signed by the Secretary of the State Board will be forwarded to the architect and the County Superintendent of Schools.

4. Plans and specifications submitted for approval shall not be eligible for review and recommendation for approval until all the requirements of procedure have been complied with.

5. The following specific items are suggestive of the information required in plans and specifications submitted for approval. They are not intended to enumerate all the items that should be covered but rather to establish uniformity in presenting data for review.

   a. All specifications should be indexed for quick identification of individual items. It is recommended that the five sections of the specifications be in different colors for the same reason.

b. Specifications preferably should be of letter-size, bound at the left-hand side with covers the same size as the inside specifications, to facilitate filing and use.

c. The hardware schedule shall be included with the specifications. Plans and/or specifications shall clearly indicate the location of anti-panic hardware and door closers.

d. Wherever possible, drawings should not exceed 36" x 48".

e. Architectural, structural, and other kinds of mechanical work should be shown on separate drawings. They should be combined only when clarity and completeness are not impaired.

f. A key plot plan should be given on one of the drawings to indicate the location of the school building with relation to the school property and to existing structures when additions are made, and the established orientation of the building to points of the compass.

g. A better practice than that of submitting a key plot plan is to include with the final plans one sheet showing all of the items referred to under the preliminary plot plan, fully developed and including the contours and the finished grades at the building and the elevation of the first floor level. Included should be such items as the location of walls, drives, parking areas, play and organized activity areas, kindergarten play yards, and adjoining streets and sidewalks. The boundaries, the size and shape of the entire school property and the location of existing sewage disposal system are other possible items for inclusion.

h. All drawings of any nature shall be fully dimensioned to give over-all and individual unit dimensions, both horizontal and vertical, for all portions of the building, and should include the thickness of all walls, floors and foundations, together with the present and finished grades at building.

i. General drawings shall be on not less than 1/8" scale with plans for each floor and roof, elevations sufficient to indicate all exteriors of the building and materials, sections sufficient to show clearly all and any special conditions. Stairs, classrooms and corridors, furred ceilings, equipment and fixtures, floor construction, levels and thickness, wall construction, and typical windows, should be shown.

Consideration will be given to any exceptions an architect may find necessary in the scale and layout of his plans due to the unusual size of the program, provided however, that the clarity and completeness of information will not be impaired.

j. Typical details should be given at larger scale where necessary for clarity, providing complete information on wall sections, floors, and windows, with complete details for each type of window and with data on the glass area, including the vertical distances of the sill and the vision area, if any, the top of the window glass above the floor, and the distance below ceiling. Stair details should show the construction and materials, riser heights and tread widths, the over-all dimensions of the stair runs, both vertical and horizontal, and the landing levels. Details of chalkboard and tackboard trim, standing trim, etc., should be pictured. Built-in equipment, wardrobes, and all special features requiring details for proper development should be clearly portrayed.

k. Plumbing, heating, ventilating, electrical and structural plans shall be scaled to conform with the general drawings. All mechanical and structural plans and details should be developed with the same clarity and completeness that are required for the general plans. The method of ventilating clothing storage areas shall be clearly indicated by plan and section.

l. There should be shown on the drawings the interior finish, including the floor, base, wainscot, wall, ceiling and trim. A complete door and window schedule should be given. The materials used in all walls, partitions, etc., should be indicated by means of symbol key. A standard symbol key should also be used in describing electrical work. The use intended for each room or space should be written on the floor plans and not by numerical cross reference.

F. Regulations Pertaining to the Acquisition and Use of Existing Buildings for School Purposes

1. A board of education planning to acquire any existing building for instructional purposes shall comply with all procedures and regulations pertaining to the appropriation and use of capital funds and to have the building approved in accordance with the regulations of the State Board of Education which apply to the construction of a new building.

2. Any school building which has not been in use for educational purposes for a period of three or more years shall not be returned to use for such purpose unless the same has been inspected by the Bureau of School Building Services and found to meet all requirements of the State Board of Education pertaining to the safeguarding of the health and safety of the children to be enrolled therein.

G. Use of Domestic Materials on Public Works

52:33–1. Definitions

Wherever in this chapter the following words are used, they shall be held to have the meanings hereinafter given:

"Public work": Any public building, public highway, bridge, or other public betterment, work or improvement of a permanent nature, constructed, reconstructed, repaired or improved wholly at the expense of the public.

"Domestic materials": Articles, materials and supplies mined or produced in the United States, and manufactured articles, materials and supplies manufactured in the United States.
Source L. 1934, C. 90, Section 4, p. 268

52:33–2. Only domestic materials to be used on public works; exception

Notwithstanding any inconsistent provision of any law, and unless the head of the department, or other public officer charged with the duty by law, shall determine it to be inconsistent with the public interest, or the cost to be unreasonable, only domestic materials shall be acquired or used for any public work.

This section shall not apply with respect to domestic materials to be used for any public work if domestic materials of the class or kind to be used are not mined, produced or manufactured, as the case may be, in the United States in commercial quantities and of a satisfactory quality.

Source L. 1934, C. 90, Section 1, p. 267

52:33–3. Provision in contract: exception of particular materials

Every contract for the construction, alteration or repair of any public work in this state shall contain a provision that in the performance of the work the contractor and all subcontractors shall use only domestic materials in the performance of the work; but if the head of the department or other public officer authorized by law to make the contract shall find that in respect to some particular domestic materials it is impracticable to make such requirement or that it would unreasonably increase the cost, an exception shall be noted in the specifications as to that particular material, and a public record made of the findings which justified the exception.

Source L. 1934, C. 90, Section 2, p. 267

52:33–4. Failure to comply with provision in contract: contractor barred for three years

If the head of a department or other public officer having jurisdiction shall find that in the performance of any such contract there has been

a failure to comply with any such provision contained in the contract, he shall make public his finding, including therein the name of the contractor obligated under such contract, and no other contract for the construction, alteration or repair of any public work in this state shall be awarded to such contractor, or to any partnership, association or corporation with which such contractor is associated or affiliated, within a period of three years after such finding is made public.

Source L. 1934, C. 90, Section 3, p. 267

H. Wage and Hour Law

Architects and Boards of Education are advised to become familiar with the requirements of the Wage and Hour Law, Chapter 150, Laws of 1963. NJSA 34:11-56.25.

I. Transportable Classrooms

1. Any temporary transportable facility to be purchased must when erected meet the State Board of Education minimum building requirements.

   This is interpreted to include such standards as floor area, structural safety, heating, lighting, ventilation, sanitary facilities and drinking fountains.

2. Toilet facilities and drinking fountains may be used in adjacent buildings provided the facilities meet the State Board of Education requirements in these categories for the total school population. Otherwise the temporary transportable facilities must be self-sufficient in drinking fountains and toilet facilities. Running water or water coolers may be used.

J. Contractor Classification

18:11-9.1 Revised Statutes

AN ACT concerning education, authorizing boards of education to require the classification of bidders.

1. As used in this chapter:

   "Person" means and includes any individual, co-partnership, association, corporation or joint stock company, their lessees, trustees, assignees or receivers appointed by any court whatsoever.

   "Board of education" means and includes the board of education of any local school district, consolidated school district, regional school district, county vocational school and any other board of Education or other similar body other than the State Board of Education, established and operating under the provisions of Title 18 of the Revised Statutes and having authority to engage contractors for the performance of public works for the board.

2. Every board of education shall require that all persons proposing to bid on any contract with the board for public work shall first be classified by the State Board of Education as to the character and amount of public work on which they shall be qualified to submit bids. So long as such requirement is in effect, the board of education shall accept bids only from persons qualified in accordance with such classification.

3. Any person desiring such classification shall file with the State Board of Education a statement under oath in response to a questionnaire, prepared and standardized for like classes of work, by the State Department of Education. The statement shall develop fully the financial ability, adequacy of plant and equipment, organization and prior experience of the prospective bidder, and also such other pertinent and material facts as may be deemed desirable.

4. The State Department of Education shall classify all such prospective bidders as to the character and amount of public work on which they shall be qualified to submit bids. The classification shall be made and an immediate notice thereof shall be sent to the prospective bidder or bidders by registered mail within a period of 15 days after the date of receipt of the statement in response to the questionnaire; provided, however, that if the State Department of Education shall require additional information from the prospective bidder, the classification shall be made and the notice sent within 15 days after receipt of such additional information.

5. Any person, after being notified of his classification, being dissatisfied therewith or with the classification of another person or persons, may request in writing a hearing before the Commissioner of Education, and may present such further evidence with respect to his financial ability, plant and equipment or prior experience, or that of the other person or persons, as might tend to justify a different classification.

   Where the request for a hearing is related to the classification of another person, the applicant for the hearing shall notify such other person, by registered mail, of the time and place of hearing and at the hearing shall present to the commissioner satisfactory evidence that such notice was given before any matters pertaining to the classification of such other person shall be taken up.

   After the hearing the commissioner may change or affirm the classification or classifications, the subject of the hearing.

   Decisions of the commissioner, made after hearing, shall be subject to appeal to the State Board of Education in accordance with the procedure described in sections 18:3-14 and 18:3-15 of the Revised Statutes.

6. Nothing contained in this act shall be construed as depriving any board of education of the right to reject all bids. Where there have been developments subsequent to the qualification and classification of a bidder which in the opinion of the awarding board would affect the responsibility of the bidder, information to that effect shall for-

with be transmitted to the State Department of Education for its review and reconsideration of the classification. Before taking final action on any such bid, the board of education concerned shall notify the bidder and give him an opportunity to present to the State Department of Education any additional information which might tend to substantiate the existing classification.

7. No person shall be qualified to bid on any contract with the board who shall not have submitted a statement as required by section 3 of this act within a period of 6 months preceding the date of opening of bids for such contract. Every bidder shall submit with his bid an affidavit that subsequent to the latest such statement submitted by him there has been no material adverse change in his qualification information except as set forth in said affidavit. The specifications for every contract subject to this chapter shall provide that the board of education, through its architect or other authorized agent, shall upon completion of the contract report to the State Department of Education as to the contractor's performance, and shall also furnish such report from time to time during performance if the Contractor is then in default.

8. Any person who makes, or causes to be made, a false, deceptive or fraudulent statement in the questionnaire required to be submitted, or in the course of any hearing under this act shall be guilty of a misdemeanor, and upon conviction shall be sentenced to pay a fine of not less than $100.00 nor more than $1,000.00; or, in the case of an individual or the officer or employee charged with the duty of making such questionnaire for a person, firm, copartnership, association or corporation, to pay such fine or undergo imprisonment, not exceeding 6 months, or both. All such persons and any copartnership, association, corporation or joint stock company of which any such person is a partner or officer or director, and any corporation of which he owns more than 25% of the stock, shall for 5 years from the date of such conviction be disqualified from bidding on all public work in this State.

9. The board of education shall cause the forfeiture as liquidated damages to the board of any certified check or certificate of deposit deposited as bid security by any person who makes or causes to be made any false, deceptive or fradulent statement in the questionnaire or bid affidavit required to be submitted, or in the course of any hearing under this act.

10. The State Board of Education shall establish such reasonable regulations as to it may seem appropriate for controlling the qualifications of prospective bidders. The regulations shall fix the qualification requirements for bidders according to available capital and equipment, and with due regard to the organization and prior experience of the bidder and all other pertinent and material facts. No regulations of the State Board of Education for controlling the qualifications of

bidders shall become effective until at least 30 days after the regulations shall have been formally adopted and published in not less than 10 newspapers of this State.

11. No action for damages out of any court of competent jurisdiction shall lie against the State Board of Education or any State official because of any action taken by virtue of the provisions of this act.

12. This act shall take effect January 1, 1963.

II. SPACE REQUIREMENTS AND RECOMMENDATIONS

A. Classrooms and Other Instructional Areas

1. Every instructional area shall be planned in consideration of the number of pupils to be housed, the program of instruction to be followed, and the educational purposes of the room.

2. It is recommended that standard classroom areas be planned in accordance with the following table:

INSTRUCTIONAL AREAS

Grade or Subject	*Minimum*	*Better*	*Desirable*
	Provides space for only limited educational program	Provides space for more, but not all that is needed for a good educational program	Space is adequate for an enriched program that is stimulating to pupils and teachers
Kindergarten	700 sq. ft.	800-900 sq. ft.	1,000 sq. ft. or more
First Grade through Third	650 sq. ft.	800 sq. ft.	950 sq. ft. or more
Fourth Grade through Eighth	600 sq. ft.	750 sq. ft.	900 sq. ft. or more
Academic Rooms Grades Nine through Twelve	600 sq. ft.	700 sq. ft.	800 sq. ft. or more

3. Space recommendations for other instructional areas are indicated in the special bulletins available from the Department of Education. (See list on page VI.)

4. It is recommended that classrooms in high schools be varied in size to accommodate effectively the planned teaching procedure.

5. The club and extra-curricular programs of schools may require certain specialized areas, such as darkroom for photography and an inside greenhouse for the garden club.

B. Rooms Above and Below Grade

1. When a school building has a basement, the ceiling of which averages 7′ 6″ or more above the finished grade line, such basement shall be considered a story in determining the number of stories in the building.
2. The finished grade for additions and new buildings shall be not less than 1′ 0″ below the window sill of any instructional room at any point.
3. The horizontal distance from any instructional room window to any obstruction opposite the window shall not be less than twice the height from the window stool to the top of the obstruction, but in no case less than 10 feet. This would not apply to obstructions 50 feet or more away.
4. In no case shall an auditorium, assembly room, gymnasium, cafeteria or any space subject to occupancy by 200 or more persons be so situated that an occupant of its main floor, using main exits, must descend or ascend more than 8′ 0″ to reach the outside grade.

C. Ceiling Heights

1. The average ceiling height of a classroom or other instructional area shall not be less than 9′ 6″. No part of the ceiling construction at any point shall be less than 8′ 6″ high. It is recommended that an additional two inches in height be provided to allow for inadvertent variations in materials or construction which could result in the finished ceiling height not meeting this requirement.
2. The ceiling height in a shop, library, or music room shall be proportionate to the size of the room and appropriate to its use, but shall not be less than that indicated in the preceding rule.
3. The ceiling height for corridors shall be not less than 7′ 6″.

D. Corridors

1. Interior corridors shall be required in all school buildings except those with exterior exits from each instructional room and place of assembly.
2. Primary corridors in elementary schools (grades kindergarten through eight) shall be not less than 7′ 0″ in width, except as hereinafter provided.

3. Primary corridors in secondary schools (grades seven through twelve, or any combination thereof) shall be not less than 7′ 6″ in width, except as hereinafter provided.

4. Primary corridors may be reduced one foot in width, from the above requirements, when each instructional room has a direct exterior exit, and

   a. The corridor door is recessed so as not to project more than six inches beyond the corridor wall, or

   b. The corridor door swings to a 180-degree angle against the corridor side of the wall, or

   c. The corridor door swings into the room.

5. All corridors shall be increased 1′ 0″ in width where there are lockers or other provisions for storage of pupil clothing or books on *one* side of the corridor, and shall be increased a minimum of 2′ 6″ in width where there are lockers or other provisions for storage of pupil clothing or books on *both* sides of the corridor. Corridor width is defined as the distance between the faces of the walls and/or lockers.

6. Secondary corridors may be reduced 1′ 6″ below the width required for primary corridors. Secondary corridors are defined as branch corridors intersecting with a primary corridor and serving not more than three instructional rooms, with the location and plan arrangement of the secondary corridor being such as to preclude the possibility of additional rooms being added in the future, with a consequent increase of traffic load.

7. Passages, other than corridors, used by pupils shall never be less than 4′ 0″ in width including any projections.

8. There shall be no structural projections extending more than 9″, with a width of 1′ 6″, into the prescribed minimum width of corridors. Accumulative structural encroachments which reduce a minimum corridor width by more than 8″ shall not be permitted.

9. Drinking fountains shall not project into corridors more than 9″.

10. Radiators, fire extinguishers, and other recessed equipment shall not project more than 6″ beyond the face of the corridor walls.

11. Each corridor on the first floor shall terminate with a direct exit to the exterior of the building and shall not extend beyond the exit a distance greater than its own width. Dead-end pockets or recessed areas shall not be deeper than their own width.

12. The minimum ceiling height of corridors shall be 7′ 6″.

13. Corridors, while serving primarily as sheltered passageways between

the several parts of a building, may be modified to adapt them to such added uses as lounges, social rooms, and specialized activity areas.

E. Exits

1. A unit of exit door width shall be 22″ clear, except that a 42-inch opening may be considered as two units.

2. The minimum number of exit door widths from the first or entrance story shall be:

   a. One unit of exit width for every three instructional rooms on the first or entrance story, plus

   b. One unit for each required unit of stairway width from upper floors, plus

   c. One unit of exit width for each required unit of stairway width from the rooms below grade.

   d. One unit of exit width for each 100 persons based on designed capacity or 7.5 square feet of floor area for auditoriums, 9 square feet for gymnasiums if they are used for assembly or auditorium purposes (other than required by e below), 10 square feet for cafeterias, and 30 square feet gross area for libraries whichever is greater.

   e. One unit of exit width for each 300 square feet of floor area of the auditorium or gymnasium in frame buildings.

3. All exterior exit doors shall be not less than 2′ 6″ in width.

4. Instructional rooms having direct entrance only through an assembly room, stage, gymnasium, cafeteria, all-purpose room or a room of similiar function, shall be provided with exterior exit doors.

5. At least one available stairway or exit shall be within 120 feet, as measured along the center line of the corridor from the center line of the instructional room exit doors.

6. An "exit way" is defined to mean a doorway or doorways, interior or exterior, providing safe access to corridors and to exterior open space with safe access to the street.

   a. Every room or other space with a capacity of over 100 persons or over 2,000 square feet in area shall have at least two exit ways, as remote from each other as practicable.

   b. Every room, gallery, balcony, or other space having a capacity in excess of 600 persons shall have at least three exit ways.

c. Where the capacity of such space is more than 1,000 persons, there shall be not less than four exit ways.

d. Exit ways shall be appropriately located in every room, gallery, balcony, or other space having a capacity of more than 200 persons.

e. Capacities shall be based on designed capacity or 7.5 square feet gross per person for auditoriums, 9 square feet for gymnasiums and all-purpose rooms, 10 square feet for cafeterias and 30 square feet gross area for libraries; but the number of exits shall not be less than required under section E. 2. d. and 2. e. above.

7. Required exit ways may use communicating corridors leading to exterior exits; but, emerging from any one place of assembly, they shall not use a common stairway.

8. There shall be at least two exit ways from all heater rooms; one shall lead to the exterior of the building. In heater rooms, where the floor area is 100 square feet or less, there need only be a door to the exterior.

F. Doors

1. All pupil exit doors from the building including exterior exit doors from auditoriums, gymnasiums, all-purpose rooms, and cafeterias, shall be provided with bar-type anti-panic hardware, except that doors from the heater room, locker rooms, shop and other special instructional areas may be of the knob-operated type always permitting egress. Classrooms and kindergarten rooms may have knob-operated hardware on exterior doors. Two or more classrooms using a common exterior exit shall have anti-panic hardware on the exterior door.

2. All pupil interior exit doors from auditoriums, gymnasiums, all-purpose rooms, cafeterias and any space having a capacity of 200 or more persons shall not be capable of being locked unless hardware of the anti-panic type is used.

3. No door opening from an instructional room into the corridor shall be less than 30 inches wide, and all such doors shall swing out into the corridor unless otherwise permitted. No door shall be so located as to offer any obstruction to, or to block, the maximum free opening of doors from rooms, stairways, or exits. Doors may swing into an instructional room providing the room has an exterior exit.

4. Locks on all doors of rooms used by pupils, except where anti-panic hardware is required, shall be of the knob-operated type only and

permicting egress from the room at all times.

5. All exterior doors, the interior doors to main pupil toilet rooms, doors between the corridor and the heating room, smoke screen doors, and all fire doors shall have closers or other approved self-closing type of operation. Individual classroom exit doors are excepted from this requirement.

6. Doors to smoke screens shall be solid—core veneered, kalamein, or hollow metal, 1¾" thick. Such doors shall contain glass panels of clear wire plate glass. Such doors shall not be less than 30 inches wide. Door hold-back devices of any type shall not be permitted.

7. Exterior entrance and exit doors shall contain panels of clear glass, except emergency doors from assembly areas. The glass panel above the lock rail shall be not less than 3/16" thick. Any glass area below the lock rail or directly behind anti-panic bolts shall be clear wire plate glass or tempered glass.

8. All pupil exit doors shall swing outward.

9. Heater rooms shall be shut off from the interior of a building by hinged type Class "B" fire door equipped with self-closing hardware. Such door shall swing into the heater room.

10. Fire doors shall be provided at the stage, fan room, mechanical equipment room, head of basement stairs, openings to permanent stairs of attic and roof spaces and shall be kalamein, hollow metal or class "B" label wood fire doors. Such doors shall be equipped with approved closers.

11. All fire and smoke screen doors shall be clearly lettered "Fire Door —Keep Closed" or "Smoke Door—Keep Closed."

12. Every principal and janitor of a school having a furnace room, hallway, or stair tower, fire or smoke doors shall keep them closed during the time the building is occupied by teachers and pupils. R. S. 18:14–107.

Any principal, teacher or janitor failing to comply with the provisions of sections 18:14–106 and 18:14–107 of this title shall be guilty of a misdemeanor and shall be punishable by a fine not to exceed one hundred dollars for each offense. R. S. 18:14–108.

Windowless Instructional Areas

1. Windowless instructional rooms, including libraries and music rooms, for which there is no provision for daylighting, will be permitted subject to compliance with the following requirements:

a. A secondary means of exit from each room shall be available in addition to the regular corridor exitway. This may be via an adjoining instructional area to a second corridor, directly to such second corridor, or into an adjoining instructional area provided with not less than one emergency exit door or window as set forth on Page 69, paragraph 11. Locks on doors leading to a secondary exitway shall not be permitted. Such doors shall be lettered: "Emergency Exit Door—No Locks Permitted".

b. Corridors around any group of windowless instructional rooms shall be provided with electro-magnetically controlled smoke doors so located as to assure smoke-free exit from such windowless rooms. The electro-magnetic controls shall be integrated with and so devised as to close these doors in the event of fire through the functioning of the automatic fire detection system. The width of these smoke doors shall be sufficient to maintain the required minimum corridor width.

c. Where a school building has windowless rooms occupied by five or more pupils without a second means of exit. the building or the area involved shall be provided with an underwriter's approved sprinkler system. Provided further that the area involved shall be closed off by automatic self-closing doors activated by smoke detectors in the event of fire.

G. Stairways

1. A unit of stairway width shall be 22″, except that 42″ may be considered as two units, the same as for exit unit width. All widths shall be taken clear, not including handrails and newels. No exit stairway shall be less than 42″ wide between handrails.
2. At least one available stairway or exit shall be within 120 feet, as measured along the center line of the corridor from the center line of the instructional room exit doors.
3. Every building of two or more stories not exceeding 12 classrooms above the first floor shall have not less than two stairways remote from each other. For each additional six classrooms, or fraction thereof, above the first floor, one additional stairway shall be provided. When four unit stairs are used, not less than three separate stair towers shall be provided. Four unit stairs will be counted as two stair towers.
4. Stairways shall be so located with respect to corridors, passages, and rooms that no corridor shall extend beyond the stairs a greater distance than the width of the corridor.
5. One unit of stairway width shall be required for every three classrooms or instructional rooms, or fraction, thereof, above the first floor.

6. No stair run shall exceed 15 risers in height.
7. Risers in stairways shall not exceed seven inches in height.
8. Treads shall be not less than 11 inches, including nosing which shall not exceed a one-inch projection.
9. Treads shall have a non-slip surface of not less than three inches. Treads at the top, bottom and intermediate landings shall be flush with the adjacent surfaces, and the top tread on each run shall have a non-slip surface extending not less than 12 inches from the riser.
10. Stairways shall continue with no decrease in width along the direction of exit travel.
11. Winders shall not be permitted on exit stairs.
12. The distance from the first riser to the smoke-screen door shall be equal to not less than twice the width of the smoke-screen door.
13. Handrails shall be provided upon both sides of the stairs. Inside handrails shall be continuous from the top of the stairs to the bottom. Balustrades at sides and top of stairs shall not be less than four feet high. Balusters shall not be more than 8 inches apart.
14. When the width of a flight of stairs exceeds 84 inches and has more than three risers, an intermediate handrail, continuous between landings and securely supported, with no projection, shall be provided.
15. All stairways and smoke screen partitions shall be built of non-combustible materials. All glazing in stair halls or towers shall be of wire glass except exterior windows. Such windows shall be protected by railings or other devices for the safety of children, where sill heights are less than 48″ above the floor level of the landing.
16. All stairways shall be enclosed with smoke-screen doors and partitions.
17. There shall be no storage spaces, closets or rooms under exit stairways. No interior doors or openings except from corridors shall be permitted in stair towers. The floors, walls and ceilings shall be of noncombustible materials designed to provide not less than a one-hour fire resistance rating.
18. All exit stairways shall be provided with natural light at each floor level above the finished grade.
19. Open stair wells shall not be permitted.
20. All exit stairways shall terminate in a direct exterior exit.
21. Convenience stairways for pupil use shall not be accessible from

corridors and shall meet the requirements for exit stairways except that natural light and exterior exits are not required. Continuously energized artificial illumination shall be provided on a separate circuit.

H. Ramps

1. No ramp for pupil use, including auditorium floors, shall exceed a one-foot rise for each ten feet of run.
2. Ramp floors shall have a non-slip finish.

I. Interior Courts

1. The horizontal distance from any instructional room window to any light obstruction of an interior court wall, top of cornice, or parapet opposite the window shall be twice the height from the window sill to the top of the obstruction, but in no case shall be less than 30 feet.
2. Interior closed courts shall have exit facilities operable from the court at all times that the building is occupied.
3. Interior closed courts shall not be used in buildings of frame construction.

III. LIGHTING IN SCHOOL BUILDINGS

Enlightenment and Lighting

Schools are established by society to provide enlightenment for its young citizens. All parts of the school and all phases of construction are consciously planned to achieve an integrated learning environment that is wholesome, healthful and efficient. Of all of the elements that make for good classroom learning, lighting is one of the most important.

To obtain good lighting in a classroom is not so simple a task as it may appear at first to be. A casual observer may step into a classroom and quickly judge that the lighting installation seems to be producing adequate illumination. Accurate judgments can be made, however, only after one submits himself to long experience within the classroom situation. Lighting for all purposes has in recent years been an important area of research by our universities, manufacturers of lighting equipment and such organizations as Illuminating Engineering Society, the National Council on Schoolhouse Construction, The Public Health Association, the American Institute of Architects, the American Institute of Electrical Engineers and the American Standards Association.

Of especial interest to those concerned with school lighting are the joint efforts of the Illuminating Engineering Society, the American Institute of Architects and the National Council on Schoolhouse Construction culminating in the development of the "American Standard Guide for School Lighting" which it is recommended that school administrators, boards of education and architects obtain for their guidance in planning better school lighting.[1] Out of these researches has come unanimity of agreement on the basic principles underlying the discussion and recommendations presented herewith.

Basic Principles of Good Lighting

1. There must be adequate light for the tasks required of pupils.

There are many different kinds of learning spaces within a school, each of which is designed for a specific type of learning activity. The quantity of light deemed desirable for activities pursued in a gymnasium or auditorium may be far different from the lighting needs of a classroom, with its emphasis on reading and writing, and of a drafting or sewing room, where demands for fine discrimination are great. Sometimes the kind of pupils to be housed in a learning space makes advisable an abnormal quantity of light, as would be true for a classroom for partially-seeing pupils and for those using lip-reading techniques.

2. The light in all parts of the room should be balanced to obtain high-quality seeing conditions.

Installations can provide a satisfactory quantity of light in a room, and yet result in extremely poor seeing conditions. Quality lighting is a matter of balance of brightness areas in a room. Great variations in brightness areas in a room cause eye fatigue in pupils.

The pupil in a classroom must adjust to three areas of brightness: a. the brightness of the task itself (e. g., the page in a book), b. the brightness of the immediate surroundings of the task (e. g., the desk top), and c. the brightness of the entire peripheral field of vision (everything the eye sees in the field of view, upward, downward, and on both sides). The eye can adjust readily to *changes* in the quantity of light, but it cannot adjust to excessive differences which exist *simultaneously* in various parts of the visual field. Excessive brightness differences in a classroom are the real causes of glare and eye fatigue.

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[1] Available from Illuminating Engineering Society, 345 East 47th Street, New York 17, New York at 50 cents per copy.

Table I

Required Installed Lighting Levels in Schools

Locations	*Minimum Footcandles*
Classrooms and Instructional Areas—on desks	30
Study halls, lecture rooms, art rooms, offices, libraries, shops, laboratories, and secondary school cafeterias	30
Classrooms for partially-seeing pupils and those requiring lip-reading—on desks	50
Drafting, typing, and sewing rooms	50
Reception rooms, gymnasiums, all purpose rooms and swimming pools	20
Auditoriums (when not used for study), elementary school cafeterias, locker rooms, washrooms, corridors containing lockers, stairways	10
Open corridors and store rooms	5

Of first importance is the concept that the brightness relationship of the various surfaces in the visual area must be kept within recommended limits. When the eye fixes on a task, an adaptation level is established. This adaptation level is a combination of task brightness and field brightness. As the eye changes from a field of one brightness (i. e. the book) to a field of another brightness (i. e. the chalkboard) the eye readapts to the new brightness level. If there is much difference between the two levels, a period of time is rquired for the eye to adapt itself completely to the new situation. Furthermore, if the difference in brightness is too great, the reaction will be discomfort, attended by a transient change in pupillary opening. To avoid this, for large surface areas and wherever good visual performance is required, the difference in brightness should be kept within desirable limits.

It is usually desirable to limit the brightness of sources of light exposed toward the work so that seeing is not hindered by reflections from the detail of the task, nor from the background.

Taking these points into consideration, the principles for providing a comfortable and efficient visual environment are as follows:

1. Any school lighting system should be designed in such a manner that it will contribute to a cheerful, friendly and esthetically pleasing environment.

2. Under optimum conditions for visual comfort and efficiency, the brightness of the task should be equal to or slightly greater than

the brightnesses of the entire visual environment.

NOTE: For design purposes, the task concerned is assumed to have a 70 per cent reflectance—a surface which will produce a brightness of 0.7 times the footcandle level on the task. For example: Level of illumination is 50 footcandles. Reflectance assumed to be 70 per cent. Brightness is 35 footlamberts, which would be the reference task brightness. In the principles, the brightness of the visual task is meant to be this reference task brightness.

3. In a classroom the brightness of any significant surface viewed from any normal standing or sitting position should not differ excessively from the brightness of the visual task. As higher or lower brightnesses of surfaces in the visual field approach the brightness of the task, visual comfort and efficiency increase. Present research indicates that for best results with a 30 footcandle level of illumination the highest acceptable brightness of any significant surface in the visual field should not be greater than 10 times the brightness of the task. Above 30 footcandles, the brightness ratio should decrease as the footcandles increase. Although there has not yet been an authoritative pronouncement concerning desirable brightness ratios at higher footcandle levels, the ratio should show a gradual decrease from the 1 to 10 ratio as the footcandle level is increased above the 50 footcandle level. The lowest acceptable brightness of any significant surface in the visual field should not be less than one-third the brightness of the task.

4. The brightness of surfaces immediately adjacent to the visual task is more critical in terms of visual comfort and efficiency than that of more remote surfaces in the visual surround. These adjacent surfaces have lower acceptable brightness limits than surfaces further removed from the task. Present research indicates that surfaces immediately adjacent to the visual task should not exceed the brightness of the task and should be at least one-third the brightness of the task.

5. The brightness-difference between adjacent surfaces in the visual surround should be reduced to an acceptable minimum. See 3 above.

6. The characteristics of any lighting system should be such that the direct and reflected glare are not objectionable.

7. Daylight and electric light systems should conform to the same brightness and brightness-difference principles, and both systems should be coordinated in design to assure the effective contribution of both.

To be of good quality, light must be distributed throughout the classroom from all overhead directions. To avoid shadows on the working surface, right-handed children when writing should receive more light from over the left shoulder than from over the right. The reverse is true for left-handed pupils. If light is evenly distributed and diffused in all parts of a schoolroom, however, there will be no shadows and the brightness intensity will be the same in all directions.

Table II

Brightness Ratio Goals

Surroundings	*Ratio*
Between the seeing task and the immediate surroundings (desk top) with the task being the brighter surface	1 to ⅓
Between the task and the more remote darker surfaces in the surroundings (such as the floor)	1 to 1/10
Between the task and the more remote brighter surfaces in the surroundings (such as the ceiling)	1 to 10
Between luminaries or windows and surfaces adjacent to them in the visual field	20 to 1

In a small office or cubicle, with the light source directly overhead, the worker, unless he intentionally does so, never has the source of light within his field of vision. For him the surface brightness of the fixture is not an important factor. But for the pupil in a classroom, where his field of vision is normally about 170°, the surface brightness of lighting fixtures is a significant factor. The next table sets forth the *maximum footlambert surface brightnesses* of luminaries permitted by "American Standard Practice for School Lighting."

3. *Reflection Values in the pupils' environment can be controlled.* Reflected glare in classrooms often is caused by such shiny and glossy surfaces as are found in varnished furniture, glass doors or cabinets, and glass-covered pictures. Lighting fixtures themselves sometimes are so located or are of such type as to constitute a source of direct glare. The problem is minimized when brightness differences or ratios are kept within such limits as are suggested in Table II, and maximum luminaire brightness shown in Table III are not exceeded.

The reflecting characteristics of room surfaces and furniture have much to do with the brightness pattern in a schoolroom. Some of the light falling upon a surface or object is absorbed; the rest is reflected. The amount reflected, in terms of a percent, is called the reflection factor or reflectance. The lighter the color, the higher is its reflection factor. The amount of light in certain areas of a room can often be doubled merely

by repainting or by changing the color. Simply by covering chalkboards with light-colored shades or tackboards, when they are not in use, will increase appreciably the light levels on the desks near the boards. Eye hygiene calls for high reflection from all surfaces above eye level, so that the light striking such surfaces may be reflected downward upon the work or task. Surfaces below eye level should reflect slightly less light.

Colored chalkboards, because of their higher reflection values, are replacing blackboards in many schools. Classroom furniture, because of reflection factors, is increasingly constructed with natural or blonde non-glossy finishes. Variations in the color scheme from room to room, and within rooms, are desirable; in general, warm colors should be used for northern and eastern exposures, and cool colors for southern and western exposures.

Table III

Maximum Recommended Luminaire Brightness in Footlamberts

Zone	*Maximum Brightness Limits*
Vertical to 45° (See diagram)	1,000 Footlamberts
45° to 60°	450 Footlamberts
60° to Horizontal or 90°	225 Footlamberts

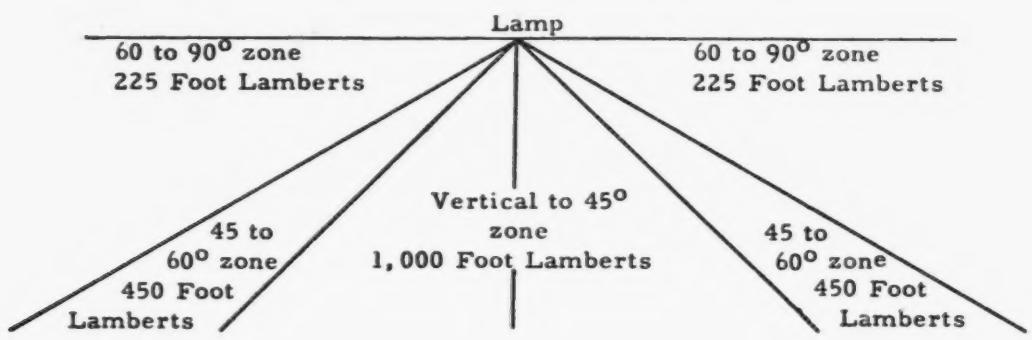

Table IV summarizes the desirable reflectances of various room surfaces.

Table IV

Desirable Reflectances of Room Surfaces

Surface	*Reflection Factor*
A—Ceilings, white	85-80%
B—Walls	60-50%
C—Furniture, light-colored	50-30%
D—Floors, light-colored	30-15%

4. *For the achievement of good lighting conditions within a classroom, the selection of luminaires is extremely important.* There are many types of lighting installations on the market, made by many companies.

Lighting Requirements for New Jersey Public Schools

The purpose of this lighting discussion is two-fold. It is designed as an educational instrument, to help boards of education and school administrators to understand the many faceted factors involved in good school lighting. It is also designed to show, as explicitly as possible, what is required in new public schools by *Schoolhouse Planning and Construction, A Guide.*

Having optimum seeing conditions in schools can be accomplished both practicably and economically. Fixtures providing a good quality of illumination ordinarily do not cost any more to install and operate than do those productive of inferior results. Other factors affecting the quality of the lighting environment, such as the treatment of the windows, color and reflectances when properly solved represent the matter of knowledge in the field of lighting more than that of cost. Boards of education are therefore advised to give this phase of school planning their most careful attention.

Minimum Requirements for School Lighting

1. The light intensity required for rooms used for instructional or study purposes may be obtained through the use of daylight or a combination of daylight and artificial lighting in rooms used exclusively for these purposes during daylight hours. Rooms used at night for instructional and study purposes must have artificial illumination sufficient to meet minimum intensity requirements.
2. The installed light intensity in the several areas within a school shall not be less than those indicated in Table I.

3. The brightness ratios as indicated in Table II in rooms used for instructional and study purposes shall be the goal to be approached as nearly as is practicable.

4. The maximum permissible fixture brightness within the viewing angle of between 45° and 90° from the nadir shall be 1,150 foot-lamberts.

Recommended Goals for School Lighting

It is believed that boards of education generally will not be satisfied to build schools with lighting which no more than meets the minimum requirements. For those wishing to provide a more satisfactory lighting environment, there are presented the following recommended standards.

1. Light intensities in schools should equal those indicated in Table VI.

Table VI

Recommended Light Intensities

	Footcandles
Classrooms and other instructional areas (on desks)	50
Study Halls, Cafeterias in high schools, Libraries, Shops, Laboratories, Offices and Art Rooms	50
Classrooms for the Partially Seeing	70 to 100
Drafting, Typing and Sewing Rooms	70 to 100
Reception Rooms, Gymnasiums, All-Purpose Rooms, Swimming Pools	30
Auditoriums (when not used for study) Elementary School Cafeterias, Locker Rooms, Washrooms, Corridors with Lockers, and Stairways	10
Open Corridors and Store Rooms	5

2. The brightness ratios for surfaces in instructional and study rooms should equal those indicated in Table II.

3. Fixture brightness in rooms used for instructional or study purposes should not exceed those indicated in Table III.

4. Windows should be provided with low light transmission glass or other medium to reduce window brightness to not more than ten times task brightness in rooms used for instructional and study purposes.

Special Lighting Requirements

In shops and gymnasiums direct luminaires of the reflector or troffer type shall be permitted. Such fixtures shall be mounted at a minimum distance of nine feet from the floor to the lower part of the fixture. Reflectors or troffers shall be deep enough to cut off a direct view of the lamp at an angle above 45 degrees (when troffers are viewed from the side).

General Daylighting Requirements

1. It is recommended that all instructional areas, except gymnasiums, cafeterias and auditoriums, have a window area of clear glass or other transparent medium. When instructional areas are provided with windows they shall comply with the following requirement:

   a. The height of the window area shall not be less than 5'6" above the finished floor extending downward to the window stool.

   b. The net height of the window area above the window stool shall not be less than 30 inches.

   c. The window area shall have an aggregate horizontal length of not less than 50 per cent of the longest exterior wall, but in no case less than ten feet and shall consist of clear glass or other transparent medium having a light transmission factor of not less than ten per cent.

   d. Window stools shall not be more than 36 inches above the finished floor except in shops, home economics rooms, laboratories, art rooms, music rooms, libraries and gymnasiums, where the height of the stool shall be optional.

   e. The lighting of windowless instructional rooms shall comply with all standards set forth under "Recommended Goals for School Lighting".

   f. At least one-half of the required minimum window area shall consist of operable sash permitting extra ventilation. Double hung windows will be computed at one-half total area.

   g. Horizontal overhead daylighting may be used to supplement the window requirements, but not to replace the required minimum.

   h. Glassblock, non-transparent glass, rigid fire retardant plastic or glass fiber reinforced plastic may be used except in the vision area provided that:

      (1) Glassblock when used shall be of the directional type.

      (2) The light transmission factor of such material shall not be less than ten per cent.

      (3) The lowest point of glassblock or other non-transparent medium including the supporting frame shall be the top of the required glass area.

i. The providing of natural light in pupil toilet rooms shall be optional.

j. Natural light shall be provided at each floor level except basements in all exit stairways.

k. Plastic and glass fiber reinforced panels of the slow-burning type shall be permitted for glazing exterior windows of school buildings provided all other requirements outlined above are satisfied.

General School Lighting Requirements

1. Switches for classroom lights shall be so wired as to permit the flexibility needed for varying light requirements in the room.
2. Corridor and stair hall lights shall be controlled by three-way switches located at convenient control points.
3. Exit lights shall be provided over exits from corridors, rooms of assembly, gymnasiums, and cafeterias.
4. All electrical installations and equipment shall be in accordance with the National Electrical Code as amended (NBFU No. 70) or the Standard Building Code of New Jersey, Parts C. D. and F. Electrical as amended.

EMERGENCY LIGHTING

1. Emergency lighting shall be provided in new school buildings and additions for stairways, corridors and exitways from auditorium, gymnasiums, cafeterias and other places of assembly.
2. Emergency lighting shall be provided for any stairway or corridor which is not provided with natural illumination.
3. The emergency source of energy for illumination shall be a self-contained type, generator type or secured from an independent generating station entirely separate from that which provides the regular source.
4. All emergency lighting systems shall provide full illumination automatically and within 15 seconds after normal source power failure.
5. The power supply source shall have a suitable rating and capacity to supply and maintain at not less than 91% of system voltage the total load of the circuits or lamps supplying emergency light and emergency power for a period of not less than one-half hour.
6. Individual unit equipment for emergency illumination shall consist of a battery, voltmeter, battery charger, one or more lamps and

a relaying device arranged to energize the lamps automatically upon failure of the normal supply to the building.

7. Unit equipment shall be permanently fixed in place and shall have all wiring to each unit installed in accordance with the requirements of the National Electrical Code (NBFU No. 70).

8. Emergency lighting systems other than unit systems utilizing flood or spot light type distribution, shall produce and maintain for a period of one-half hour a minimum intensity of five-tenths (.5) of a footcandle, measured on a horizontal plane 30" above the floor.

9. Where unit storage battery systems utilizing flood or spot light type of distribution are used, the distance between adjacent units shall not exceed fifty feet. The projectors shall be directed towards the exits and located so as to provide distribution of light over the entire floor area. Glare and sharp shadows shall be held to a minimum.

10. Emergency lighting with an independent battery operated source of power shall be provided for all windowless rooms with a capacity in excess of five pupils.

IV. VENTILATION OF SCHOOL BUILDINGS

A. Mechanical Air Supply

1. All school buildings shall be provided with a mechanical system of supply ventilation so that, during period of occupancy, each classroom, music practice room, business machine room and other instructional areas shall obtain tempered outdoor air in quantities of not less than ten cubic feet of standard air per minute per pupil.

2. Mechanical ventilation shall be provided at the rate of two air changes per hour for gymnasiums, all-purpose rooms, and combined gymnasium-auditoriums, and at the rate of four changes per hour for auditoriums.

3. Mechanical ventilation shall be provided in student cafeterias on the basis of not less than four air changes per hour; for cafeteria kitchens on the basis of not less than twelve air changes per hour; and for locker rooms, shower rooms, toilet rooms, and janitors' service rooms on the basis of not less than six changes per hour, and not less than ten air changes per hour for pupil toilet rooms not provided with windows.

4. A mechanical air supply and exhaust system shall be provided for all swimming pools, with not less than six air changes per hour.
5. Re-circulation of air is permitted, provided that the minimum quantity of outdoor air, as previously mentioned, is furnished for the different locations.

B. Air Exhaust

1. All classrooms and other instructional areas shall be provided with gravity or mechanical exhaust ventilation. Such ventilation shall be through clothing storage areas, lockers or individual room vents, but in no case shall the exhaust ventilation be direct to or from the corridor.
2. Ventilating flues or ducts leading from pupil toilet rooms shall not connect with those leading to or from any other areas, except the janitors' service rooms.
3. Mechanical power exhaust ventilation shall be provided in all shops, laboratories and science preparation rooms in which dust, gases, fumes or odors might be produced in sufficient quantity as to be deemed to be prejudicial to the health and well being of occupants.
4. Mechanical exhaust ventilation shall be installed in gymnasiums, all-purpose rooms, combined gymnasium-auditoriums, and auditoriums sufficient to provide a minimum of eight air changes per hour in warm weather.
5. Individual toilet rooms shall be provided with a mechanical exhaust system furnishing not less than six air changes per hour.
6. A built-in mechanical exhaust system shall be provided for each internal combustion engine, heat treating furnace and spray painting booth.
7. Laboratories with fume hoods shall be provided with automatic means for introduction of make-up air equivalent to quantity of air exhausted.

C. Windowless Classrooms

All windowless instructional rooms shall be provided with individual, automatic temperature controls and a heating-cooling and ventilating system so designed as to maintain the temperature at not more than 75 degrees Fahrenheit during the heating season and temperature and air changes in accordance with the performance requirements set forth in the section of the Guide pertaining to air conditioning in public schools. While highly recommended, air conditioning is not required in auditoriums, gymnasiums and cafeterias.

V. HEATING OF SCHOOL BUILDINGS

A. Weather Zones

1. The heating plant shall be capable of heating all parts of the building to a uniform temperature of 70 degrees F. in zero weather in the North Zone of New Jersey and in plus 10 degrees F. in the South Zone of New Jersey. The 40th parallel shall be the line of demarcation between the north and the south temperature zones.

B. Temperature Control

1. There shall be provided an automatic control system to assure a relatively uniform temperature in all areas occupied or used by pupils.

2. Recommendation: For temperature control purposes it is permitted to establish zones within the building. In such instances, instead of a thermostatic control in each classroom, a control is placed in each zone, and the zone might be all of the classrooms on one side of the building, or all of the rooms on one side of a wing of the building.

3. Certain parts of school buildings, such as the auditorium, the gymnasium, and the offices, should be so zoned as to permit them to be heated as separate units, for they will often be used when the rest of the building is idle.

C. Air Intake

1. Heater rooms shall be provided with an outside air intake for the proper combustion of fuel. The free area of the intake shall be not less than 75 per cent of the smokestack area.

D. Safety Devices

1. All coal, liquid or gas fired boilers, and vessels or furnaces used for heating or for domestic hot water shall be provided with all prescribed safety devices recommended by the latest published rules of the National Board of Fire Underwriters. These shall include solenoid vapor valves on all gas pilot lines.

2. Where bottled gas is used for any purposes, the location of containers shall be in accordance with the latest published standards of the National Board of Fire Underwriters for the storage and

handling of liquefied petroleum gas as recommended by the National Fire Protective Assocation.

3. Not less than two emergency cut-off switches for all heating furnaces shall be provided, clearly lettered and conveniently located, one at or near each exit doorway.

4. All heater rooms shall be provided with an exterior window or skylight to serve as a release in the event of an explosion.

NOTE: Gas fired unit ventilators in classrooms are not approved at this time.

VI. AIR CONDITIONING

Purpose

The intention of this Division is to establish regulations conducive to the safety of the occupants of Public Educational Buildings having air conditioned spaces and to the maintenance of a satisfactory ambient air environment in such structures.

A. Types of Systems

While recognition is taken of different means of classification of refrigerating and air conditioning systems by various bodies establishing standards or having jurisdiction over same, such as the American Society of Heating, Refrigerating and Air Conditioning Engineers and others, nevertheless in the interest of simplification and appropriateness relative to educational building, and for the particular reason that certain hazards are peculiar to particular types only, these systems will be classified and described as follows:

1. TYPE "P"
   Self-contained complete units, commonly purchased as an enclosed assembly of compressor, condenser, evaporator with associated equipment, motor, piping, controls, etc., and often termed "Packaged".

2. TYPE "C"
   Centrally-located equipment intended to serve one or more areas and which may consist of "Packaged" unit or units or assemblies of equipment but always situated remotely from the places that are to be cooled and/or heated, and designed to supply cooling via pipes, ducts, etc.

3. TYPE "S"
   Split system wherein the compressor and condenser are positioned in a location remote from the areas to be served, but having the evaporative equipment within the space to be supplied, or wherein the air of said space will be in direct contact with the expansion coils of the evaporator.

NOTE

Air conditioning systems in public educational buildings may comprise more than a single type in any one or more buildings and, in which case, the scope, extent and location of each type shall be clearly delineated and identified on the drawing.

B. Equipment Safety

1. All equipment and method of installation must conform to the requirements of the following:

   STANDARD #90A of the American Insurance Association entitled "Standard for the Installation of Air Conditioning and Ventilating Systems of other than Residence Type".

   SAFETY CODE FOR MECHANICAL REFRIGERATION (American Standards Association #ASA B9.1—1964 ASHRAE Standard 15-64 which are identical).

   NATIONAL ELECTRICAL CODE

In addition to any and all items required by the preceding, the following stipulations shall also apply:

2. FOR TYPE "P" SYSTEMS OF UNITS:

Self-contained complete units shall not exceed 5 tons of refrigerating capacity for installation in any one classroom (as distinguished from other instruction rooms such as Shops, Music Rooms, etc.). Proportionately larger self-contained complete units may be installed in larger instruction rooms that have movable fenestration in the same relative proportion as typical classroom movable fenestration. No self-contained complete unit or an evaporator component of any air conditioning system shall be installed in any room not conforming to contemporary GUIDE requirements in fenestration and movable sash.

Self-contained complete units must have UL approved reliefs designed to discharge directly to the exterior or set in such manner (including piping if necessary) so that their discharge will not enter the fresh air intake or the room.

The definition of self-contained complete units is intended to include the window type.

Precaution: Where type "P" systems are used the equipment including controls must be checked for condition and correct function annually by competent personnel, and an annual report to this effect must be made to the Building Services Department of the State Board of Education.

Minimum noise levels may have to be indicated.

Self-contained, gas-fired units are prohibited in any room of pupil or staff use at this time.

Nothing in the preceding shall be construed as prohibiting the use of gas fired or electrically driven refrigerating equipment for other than treatment of air to be delivered to classrooms, or for precluding the use of small or model self-contained units in shops or laboratories for instructional purposes in the study of such devices.

3. FOR TYPE "C" SYSTEMS:

Safety equipment for the various forms of this type of system including low and high pressure delivered air, chilled water, etc., is described in the preceding references of equipment safety. Recommendation is for the addition of UL approved smoke sensitive electronic devices in ductwork.

4. FOR TYPE "S" SYSTEMS:

Wherever direct expansion (evaporator) equipment is located in any area occupied by pupils or teaching staff, including stages, auditoriums, gymnasiums, multi-purpose rooms, instruction rooms, cafeterias, etc., the following stipulation must be observed:

(A) That such equipment and means be allowed ONLY in rooms or spaces having fenestration inclusive of movable sash to the same extent and in the same degree as presently required in instruction rooms generally and in proportionately the same amount.

C. Performance Requirements

The air conditioning system including all of its equipment and controls shall be designed to effect an ambient air condition of 80°F. with a relative humidity not exceeding 50% when the exterior air is 95°F. dry bulb and 78°F. wet bulb, and in general be capable of holding the interior spaces when at occupied capacity to a temperature of not less than 15°F. lower than the exterior temperature and with relative humidity not exceeding 50%. Systems producing a differential in temperature exceeding 20°F., when rooms are occupied are prohibited.

The quantity of delivered air having the characteristics given in the preceding paragraph shall be not less than the number of cubic feet per person per minute of fresh air as follows, or as otherwise indicated:

"TABLE AC"

Instruction Rooms Generally	10 CFM
Shops	7-1/2 CFM
Finishing Rooms	90% of exhaust fan ratings
Music Rooms	10 CFM
Multi-Purpose Rooms	7-1/2 CFM
Auditoriums	7-1/2 CFM
Gymnasiums	7-1/2 CFM
Auditorium-Gymnasium (combined)	7-1/2 CFM
Cafeterias	7-1/2 CFM
Kitchens	90% of exhaust requirements of all range and dishwasher hoods
Lockers	10 air changes per hour
Offices (including health rooms)	10 CFM
Toilets	Guide requirements (Ventilation)
Corridors (Lockers)	5 cubic feet per hour

Nothing in the preceding shall be construed to mean that ALL rooms or any spaces of Public Educational Buildings shall be air conditioned. But if any rooms or space IS air conditioned, then that space, or any spaces so treated must comply with the stipulations of "Table AC".

D. Submissions

The designer shall certify that his submission complies in all respects with the provision of this Division of the Guide.

VII. SANITATION IN SCHOOL BUILDINGS

A. Plumbing Codes and Regulations

1. All plumbing installation shall conform to the standards of the latest published Plumbing Code of New Jersey (Part E of the Standard Building Code of New Jersey) and subsequent amendments thereto, except wherein the same is in conflict with existing regulations of the State Board of Education. (This shall be clearly indicated on the plans.)
2. Where connection to an approved sewer cannot be effected, plans and specifications for septic tanks, drainage fields and sewage treatment plants shall be in accordance with the latest published rules and regulations of and approved by the New Jersey State Department of Health. (Its letter of approval shall accompany each set of plans.)
3. Where an approved public water supply is not available, provisions for drinking water shall be made in accordance with the latest published rules and regulations as prescribed by the New Jersey State Department of Health and other authorities having jurisdiction.
4. Any water pump capable of diverting more than 100,000 gallons of water per day for any purpose shall comply with Chapter 375, P. L. 1947, as amended.

B. Toilet Facilities

1. The following ratio of sanitary fixtures based on 30 pupils per classroom shall be considered minimum requirements in school buildings. Where school buildings have self-contained classrooms with toilet and lavatory facilities, the pupils in these rooms shall not be counted in computing the number of fixtures to be installed in general toilet rooms.

   a. Water closets

Girls—Grades one through eight	One to 30 pupils
Boys—Grades one through eight	One to 60 pupils
Girls—Grades seven through twelve	One to 45 pupils
Boys—Grades seven through twelve	One to 90 pupils

   b. Urinals

Boys—Grades one through eight	One to 30 pupils
Boys—Grades seven through twelve	One to 45 pupils

   c. Lavatories

Boys and Girls—All grades	One to 50 pupils

2. No general pupil toilet room shall contain less than two of each of the respective fixtures required.
3. Kindergarten rooms shall be equipped with separate water closet and lavatory facilities.
4. When flushometer valves are used, they shall be provided with approved vacuum breakers.
5. Natural light shall be provided in all pupil toilet rooms, except individual toilet rooms, and the glass area shall be not less than 10 per cent of the floor area.
6. Entrances to toilet and locker rooms shall be screened to prevent visibility into the room.
7. All pupil toilet and shower room floors shall be ceramic tile or other similar impervious surface.
8. Water closets shall be separated by individual stalls of smooth non-porous materials to permit efficient cleaning. "Separated" does not mean extension to floor level or provision of stall doors.
9. No toilet rooms for pupils, except auxiliary toilets, shall be placed in building basements.
10. In multi-story buildings there shall be boys' and girls' toilet rooms on each floor used by pupils.
11. The temperature of domestic hot water shall be thermostatically controlled. The temperature of hot water going to all shower heads shall be thermostatically controlled by a central mixing valve or valves and so located as to be easily supervised.
12. Individual classroom toilets are not recommended for pupils above the third grade.
13. Wash fountains in lieu of separate lavatories will be computed on the basis of the following ratios:

    One 54″ circular wash fountain equals 8 lavatories.
    One 36″ circular wash fountain equals 5 lavatories.
    One 54″ semi-circular wash fountain equals 4 lavatories.
    One 36″ semi-circular wash fountain equals 3 lavatories.
    One 27″ semi-circular wash fountain equals 2 lavatories.

C. Drinking Fountains

1. The number of drinking fountains to be installed in a school building shall be in accordance with the following ratios:

    a. *Elementary Schools*

    One drinking fountain for each 50 pupils upto 250 pupils plus

One drinking fountain for each additional 75 pupils up to 550 pupils plus

One drinking fountain for each additional 100 pupils or fraction thereof beyond 550 pupils.

b. Secondary Schools

One drinking fountain for each 75 students up to 300 students

One drinking fountain for each 125 students up to 550 students

One drinking fountain for each 200 students or fraction thereof beyond 550 students.

c. When drinking fountains are installed in instructional rooms, the pupil capacity of these rooms shall not be used in computing the total building capacity to determine the number of drinking fountains required elsewhere.

2. At least two drinking fountains shall be provided in every school building, one of which is available for public use.
3. There shall be not less than one drinking fountain on each floor of multi-story buildings.
4. Drinking fountains shall be of the angle-stream type.
5. Drinking fountains shall be provided in kindergarten rooms.
6. Drinking fountains or bubblers shall not be installed in toilet rooms.
7. Angle-stream fountains may be attached to sinks or lavatories in instructional rooms.

Recommended heights for nozzles of drinking fountains are: kindergarten and primary grades, 24 inches; upper elementary grades, 28 inches; junior high school, 32 inches; and senior high school, 36 inches.

Sight-Lifting for Sanitation in School Buildings

1. A shelf 10″ wide and from 4′ to 6′ in length makes a very convenient installation in all main toilet rooms in junior and senior high schools to provide a place for books and other possessions while students are using the facilities.
2. Individual toilet rooms are recommended for all classrooms serving grades one through three.
3. Gang showers are recommended for boys. There is a trend toward gang showers for girls, with several individual showers and adjoining dressing cubicles. Each community should decide the type of showers to provide for girls in terms of local custom and desires.
4. Provision for liquid or bar soap should be made in the shower room.

5. A towel room should be considered, where each pupil may obtain a clean towel for every gymnasium period. Some schools have found a small laundry economical over a long-term period.

6. A health unit should include a waiting area, an examination room, and separate rest rooms for boys and girls, each equipped with one or more cots, with lavatory and toilet facilities conveniently accessible.

7. All windows in the lunchroom, kitchen, and related areas should be screened.

8. A dressing room with lockers, toilet, lavatory, and showers should be provided for lunchroom workers, near, but not opening directly into the kitchen.

9. A drinking fountain is a desirable feature in every elementary classroom and may be attached to the lavatory.

10. A swimming pool is a very valuable adjunct to a modern health and physical education program.

11. For gymnasium locker rooms, the best recommendation is for a small locker for every pupil who uses the gymnasium, for the storage of his gym clothes, and for enough larger lockers to contain the street clothes of the pupils who use the gymnasium at any one time.

12. Consideration should be given to the growing use of schools by pupils who are physically handicapped by orthopedic defects, cardiac disorders, and other physical disabilities. The presence of an entrance which permits easy access to the building from the ground level or the availability of an elevator in a multi-story building may often be the controlling condition which permits such pupils to continue attending school.

13. Advisable heights for toilet seats for kindergarten children are 10″ (baby size); for grades one through six, 13″ (junior size); and for grades seven through twelve and adults, 15″ (standard size).

14. Where economy is essential, consideration may be given to:

    a. The elimination of separate shut-off valves on the cold and hot water lines to separate wash bowls, and the adoption of one cold water and one hot water shut-off valve for the entire group of wash bowls in each toilet room.

    b. The installation of one long wash trough with an equivalent number of faucets and *one* trap, instead of several wash bowls with separate traps.

VIII. BUILDING SAFETY

A. Fire Safety

1. Frame construction. This is defined by subsection —"A-1" of section 18:6-66 and subsection "A-1" of section 18:7-91 of the Revised Statutes of New Jersey as follows:

   This is a building or structure of which the structural members, exterior walls, or a portion thereof, are constructed of wood, or other combustible material, or a building sheathed with combustible material and partially or entirely covered with 4 inches or less masonry or other noncombustible material.

   a. As hereinafter amplified, frame construction may be used for one-story school buildings, without basement or room below grade, provided that each classroom shall have an outside exit and that no other frame structure shall be located closer than 100 feet to any part of such frame school building. Space necessary for the heating plant may be located in a room below grade if such room meets requirements for non-fireproof construction. (See section 2-a below.) No room shall contain more than 2,500 square feet.

2. Noncombustible construction. This is defined by subsection "A-2" of section 18:6-66 and subsection "A-2" section 18:7-91 of the Revised Statutes of New Jersey as follows:
   This is a building or structure of which the outer walls, columns, piers, beams, lintels, girders and interior bearing partitions are of noncombustible materials (laminated wood beams, columns or trusses of not less than 6" x 10" nominal dimensions shall be permitted).

   a. Noncombustible construction, as thus defined and as hereinafter amplified, may be used for all one-story and two-story school buildings, provided that stair halls, heater rooms, and coal vaults are of fireproof construction with a one-hour rating for floors, walls, and ceilings. Corridor walls, floors, and ceilings, shall be constructed of noncombustible materials. All glass panels in corridors shall be of wire glass, except in display cases which are completely enclosed by non-combustible construction. Interior corridors shall be provided and the floor, walls and ceiling shall be constructed of non-combustible materials, unless all instructional rooms and places of assembly have direct exits to the outside.

3. Fire resistive construction. This is defined by subsection "A-3" section 18:6-66 and subsection "A-3" section 18:7-91 of the Revised Statutes of New Jersey as follows:

   This is a building or structure of which all structural members including walls, partitions, columns, piers, beams, lintels, girders, trusses and

floors are of noncombustible materials, and in which the floors, stair towers and all places of assembly are built entirely of noncombustible materials, and in which no woodwork, supporting material or other combustible material is used in any of the partitions, floorings or ceilings; but this definition shall include a building in which there is used, elsewhere than in the stair towers and corridors, wooden floorings and sleepers laid directly on top of a fire resistive floor, or having wooden doors, window sash, wooden jambs, frames casing or trim in other than stair towers, corridors and exit passages, or wooden rafters.

a. Fire resistive construction, as hereinafter amplified, may be used for all school buildings and shall be used for all those which are three-stories and over in height. Floors, walls, and ceilings in corridors, stair halls, and heater rooms shall have a one-hour rating. Roofs, except over stages equipped to fly scenery and boiler rooms, may be of non-fireproof construction.

4. **All auditoriums with permanent stages equipped to fly scenery shall conform to the requirements of the National Building Code, latest published edition.**

5. Fuel oil or gas burner installations, including fuel storage and fuel supply lines shall comply with the latest published standards established by the National Fire Protective Association.

6. **Corridors shall be free of all obstructions except as noted elsewhere in this Guide. Corridor lockers, display cabinets and other cabinets shall be constructed of non-combustible material.**

7. Incinerators and trash chutes when installed shall be in the furnace or heater room, or in other similar rooms and shall be in accordance with the standards of the National Fire Protective Association NFPA No. 82, as amended. They shall be designed in accordance with the latest regulations of the New Jersey State Department of Health. Open burning of waste material is not permitted.

8. **Powered grounds equipment, automobiles and other internal combustion type engines when housed within a school building shall be in rooms the floors, walls and ceilings of which have a fire resistance rating of not less than one hour. When an interior door is provided it shall be a class "B" hinge type fire door equipped with approved self-closing hardware. Such doors shall be lettered "Fire Door—Keep Closed".**

Equipment powered by internal combustion type engines may also be housed in a separate building of non-combustible construction. A wood roof shall be permitted provided the ceiling has a one hour fire resistance rating. A building of combustible construction shall also be permitted provided that no such structure shall be located closer than 100 feet to any pupil occupied building.

9. Where air ducts or pipes penetrate heater room walls, the construction around the pipes or ducts shall be such as to prevent fire or smoke spread through or around the openings. At points where heating and ventilating ducts or flues penetrate heater room walls and between each floor, they shall be equipped with heat-actuated non-combustible fire dampers.

10. Fire Escapes. (Where they are found necessary.)

    a. Fire escapes shall be constructed of iron strings, treads and platforms, with a rise of not more than seven inches in height and treads not less than 10½ inches in width, projecting not more than one inch over tread below. Treads and platforms shall have gratings of the reticulated or rectangular mesh type with bearing bars not more than ¾ inch on centers and cross-bars not more than four inches on centers.

    b. Entrance platforms shall be not more than five inches below the adjoining floor. Entrance to the platform shall be by means of a door, extending to the floor level. Platforms shall not be less than the width of the masonry opening of the doors which they serve.

    c. The stairs shall be not less than 3′ 2″ wide between handrails, supported by vertical steel members or concrete filled circular columns. Stairs shall extend uninterrupted to the ground level.

    d. Long flights of stairs shall be broken with intermediate landings not less than 3′ 6″ wide, with each run at 90 or 180 degrees to the next higher or lower run.

    e. The outside strings shall be protected by a heavy galvanized wire mesh screen or other approved protective railings not less than five feet high.

    f. Windows or doors located beneath or within 10′ 0″ of fire escapes shall be glazed with wire glass.

    g. Handrails shall be provided for each side of the stairs.

    h. Exit doors leading to fire escapes shall be not less than 2′ 6″ wide and equipped with bar-type anti-panic hardware.

    i. Gates shall not be permitted at the foot of any fire escape unless equipped with anti-panic hardware.

    j. Spiral slide or tubular fire escapes. Slide type fire escapes hereafter installed to provide additional means of egress from heretofore erected buildings shall be of approved type and conform to the following:

(1) They shall not be used to provide means of egress from buildings exceeding 40′ 0″ or three stories in height. The pitch and design shall be such that a person using the chute will be discharged without injury. Doors at the entrance to the chute shall have approved panic bar releases and shall swing with the exit travel and be so installed that they will not obstruct the use of the chute. If doors are installed at the lower end of the chute, they shall be equipped with a releasing device on the inside such as a kick plate.

(2) All sheet metal used for the chute shall be non-corrosive, shall not be painted in the inside and shall be maintained so as to be free from rust. Any part of the chute with which the user may come in contact shall be free from cracks, crevices, or any projection or roughness which may cause injury or reduce the effectiveness of the chute.

(3) All chutes shall be of sufficient size and ample strength and be supported in a substantial manner.

11. Fire Alarms and Automatic Fire Detection

a. The installation of approved automatic fire detection equipment shall be required in all existing public school buildings within five years from September 11, 1963 except that the following types of school buildings shall not be required to be so equipped:

(1) One story buildings with a direct exit to the outside from each classroom, library and other instructional rooms and places of assembly (including cafeteria, auditorium, gymnasium and multi-purpose room). No exterior exit door shall open onto a completely enclosed court or other inaccessible space.

(2) One story school buildings of non-combustible construction, including roofs, having a direct exteror exit door or an operable window sash not less than 2′ 6″ wide and 3′ 0″ high with a clear area of not less than 7½ square feet in each instructional room and direct exterior exit doors sufficient to provide exit units for not less than one-half the capacity of places of assembly (including library, cafeteria, auditorium, gymnasiums and multi-purpose rooms). When an operable sash is provided the sill shall be not more than 3′ 0″ above the finish floor. No exterior exit door or emergency window shall open onto a completely enclosed court, roof or other inaccessible space.

b. Every new school building and every addition to a school building shall be equipped with an Underwriters' approved electrical,

closed circuit, supervised fire alarm system of which an Underwriters' approved automatic fire detection system shall be an integral part, except as exempted above.

c. The automatic fire detection system shall detect an abnormal rate of rise of air temperature by means of the pneumatic principle, thermopile principle or electric thermostat principle of the fixed-temperature or combination fixed-temperature and rate-of-rise type, or designed to detect abnormal visible smoke densities or gaseous products of combustion, or automatic sprinkler type equipped with waterflow alarm devices.

d. The new fire alarm and automatic fire detection system in building additions shall be connected to the system in the existing building so that all stations and detectors throughout the entire school plant will actuate all alarm bells or horns.

e. The automatic fire detection and fire alarm system shall be installed in accordance with the National Fire Protective Association Standards Nos. 70, 71, 72 and 72C as amended and in accordance with the recommendation of the equipment manufacturer. All wiring shall be installed and securely fastened in accordance with the National Electrical Code NFPA No. 70.

f. Fire detecting equipment shall be located on the ceiling or on the side walls near the ceiling and shall be installed throughout all parts of the protected premises including all rooms, corridors, storage areas, basements, attics, lofts and other accessible spaces; and inside closets, elevator shafts, dumbwaiter shafts, enclosed stairways, chutes, and other minor enclosures.

g. Fire detectors shall not be required in buildings or those portions of building protected by an approved automatic sprinkler system equipped with waterflow alarm devices connected to sound all the audible fire alarm devices in the building.

h. An exterior fire bell and flashing or revolving light shall be provided to alert outsiders in the event the building is not occupied except that school buildings directly connected to a municipal or approved central alarm office or fire house shall be exempt.

i. The alarm system and control unit shall be of a closed circuit supervisory type operating on alternating or direct current. An emergency source of energy shall be provided by a generator, dry or wet batteries to operate a trouble bell or light indicating failure of the primary external source of power.

Every school district is urged to provide an emergency source of energy of sufficient size and type to maintain the automatic fire detection and manual alarm system for not less than twenty-

four hours. Batteries when used shall have a minimum shelf life span of not less than one year.

When an emergency source of power is provided the system shall be so designed that automatic switching of emergency power is provided in case of main power failure. The change shall be accomplished without interruption of service and shall not cause a fire alarm signal but shall cause both visual and audible trouble signals to respond. Automatic return to normal shall be provided when the primary supply is restored. In addition to the trouble alarm signals, separate and distinct audible and visual fire alarm signals shall be provided. A silencing switch shall be provided for the audible trouble signals and so arranged that a trouble light will be energized at all times when the switch is in off-normal position.

j. All fire alarm signals shall be automatically locked in at the control panel until manually reset. The manual reset switch shall be of the self-restoring type which cannot be left in an abnormal position and shall be enclosed within the control cabinet or located so as not to be readily accessible to unauthorized personnel.

k. Manual fire alarm stations shall be located in the heater room, kitchen area, assembly rooms, stage, main office and near each principal exit in corridors, so that it shall not be necessary to travel more than 120 feet from the door of any room used by pupils to reach a station on the same floor.

l. Fire alarm signals shall have an auditory sound distinct from all other signals within the building, shall not be used for any other purpose and shall be so located that persons in all areas of the building including high noise areas such as music rooms, kindergarten, shops, gymnasiums and locker rooms shall be able to hear the signal.

m. It is recommended that the internal fire alarm and detection system be directly connected to the municipal or central alarm office so that the fire department will be automatically notified.

n. Every principal of a school building of two or more rooms, or of a school of one room, when located above the first story of a building, shall have at least two fire drills each month within the school hours and shall require all teachers of such schools, whether occupying buildings of one or more stories, to keep all doors and exits of their respective rooms and buildings unlocked during school hours. Where school buildings have been provided with fire escapes they shall be used by a part or all of the pupils in performing every fire drill. (R. S. 18:14–106.)

12. Fire Extinguishers

a. Fire extinguishers shall be of a type listed by the Underwriters' Laboratories, Inc. A 2½-gallon water type or a Class "A" type extinguisher of equivalent size shall be provided in all corridors. The location of fire extinguishers shall be indicated on the plans and such equipment shall be a part of the basic contracts.

b. Extinguishers shall be housed in a special cabinet or recess wall rack clearly identified and readily accessible at all times and so distributed that one 2½-gallon water type extinguisher or equivalent shall be not more than 100 feet travel distance from any point, and so that there will be not less than one for each 5,000 square feet of floor area or fraction thereof. In trade schools and shops the travel distance shall not exceed 50 feet and the number be not less than one for every 2,500 square feet of floor area.

c. For locations where fire may occur in flammable liquids, gases, grease or electrical equipment, including, but not restricted to, shops, chemistry and physics laboratories, stages, faculty rooms with cooking facilities, home-making rooms, kitchens and garages, at least one five-pound dry chemical type shall be provided in addition to those required in 12b above. At least one 15 pound CO_2 or Class "B" underwriters listed dry chemical type extinguisher shall be provided for heater rooms. A fire blanket shall be provided in home economics rooms.

13. All ducts, flues and plenums used as air ducts shall be constructed of non-combustible material. (See also item 9 above.)

14. Exhaust ducts shall not empty into the attic space, but shall be direct connected to the exterior with non-combustible materials.

15. No exhaust shall empty into stair halls or corridors.

16. Elevators and Dumbwaiters shall be designed in accordance with the American Standard Safety Code for Elevators, Dumbwaiters, and Escalators, ASA A17.1.

B. Structural Safety

1. The following structural design standards in their most recently published or amended form shall be a part of the New Jersey School Building Code.

a. "Building Code Requirements for Reinforced Concrete," (ACI 318-47). Approved as American Standard by the American Standards Association.

b. "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings." American Institute of Steel Construction.

c. "Standard Specifications for Open Web Steel Joists J-Series and H-Series." "Standard Specifications for Open Web Steel Joists High Strength Longspan or LH-Series." American Institute of Steel Construction.

d. "American Standard Building Code Requirements for Masonry." Issued March 15, 1944 by the American Standards Association as American Standard A41.1-1944.

e. "National Design Specification for Stress-Grade Lumber and its Fastenings." Recommended by the National Lumber Manufacturers Association, Washington, D. C.

2. School buildings and their accompanying structures shall be designed for all conditions of loading, as specified in the American Standard Buildings Requirements A58.1-1945, "Minimum Design Loads in Buildings and Other Structures," approved June 19, 1945 by the American Standards Association, and sponsored by the National Bureau of Standards, except as hereinafter specifically modified or as modified by future revisions.

3. The live load assumed for purposes of design shall be the greatest loads that probably will be produced by the intended occupancies or uses. The assumed live loads, considered as uniformly distributed, shall be not less than the values given in the following table:

Occupancy or Use	*Live Load Lbs. Per Sq. Ft.*
Auditoriums and assembly halls with fixed seats on sloping or stepped floor	60
Movable or fixed seats on level floor	100
Stage floor	100
Balconies	
Fixed seats	60
Movable seats	100
Classrooms	50
Libraries, larger than normal classroom (weight of book stacks shall be computed at not less than 20 lbs. per cubic foot)	80
Laboratories, larger than normal classroom	60
Stairs, landings and fire escapes	100

Occupancy or Use	*Live Load Lbs. Per Sq. Ft.*
Shops	
For light operations	125
For agriculture, machinery, automobile repair	150
Store rooms	100
Toilet rooms	60
Corridors	100
Cafeterias	100
Kitchens	100
Fan rooms	150
Floor over boiler room	80
Gymnasiums	100
Grandstands, bleachers, etc.	100

4. All exterior bleachers and grandstands shall conform to the latest published requirements of the N F P A Standard No. 102 for bleacher construction.

5. There shall not be placed, or caused or permitted to be placed, on any floor or roof of a building or other structure a load greater than that for which such floor or roof is designed.

6. Roofs shall be designed for a uniformly distributed load (including snow loads) on the horizontal projection as described in the following schedule of loads. The load shall be in addition to the dead load and wind load.

Roof slope	*Uniform Load Over Horizontal Projection Pounds Per Square Foot*
Less than 20°	30
20° or more	20

7. Roofs to be used for promenades shall be designed for minimum load of 60 pounds per square foot in addition to the dead loads. Roofs to be used for other special purposes shall be designed for appropriate loads.

8. Earthquake loads shall not be required by this Guide.

C. Equipment Safety

1. In industrial arts and vocational shops, every portable and stationary electrically operated device or motor, grinder, glue pot, and

portable hand and stand lamp shall have its framework effectively grounded and all portable electrical tools and machinery shall be equipped with electrical plugs and receptacles to ground the electrical connections in conformity with the regulations of the New Jersey State Department of Labor. At least two emergency cut-out switches shall be provided, one at or near each end of the shop. Each individual piece of motorized electrical equipment, except portable hand tools, shall be controlled by a magnetic type switch or other similar arrangement whereby each piece of equipment must be manually reactivated after current interruption.

2. The protection from machinery in industrial shops shall be in accordance with the requirements of the Vocational Division of the New Jersey State Department of Education.

3. An emergency cut-off switch for all fuel firing systems shall be provided, conveniently located and clearly distinguishable.

4. All gas heaters shall be vented to the exterior of the building.

5. Assembly rooms and auditoriums shall be provided with a convenience outlet at the probable location of a portable projector. A built-in speaker cable shall be run from that location to a stage outlet.

6. Window guards, when used, shall be of open-wire mesh arranged so that they may be opened from the inside.

D. Gas Installation

1. A check valve shall be installed in the line supplying gas to each classroom, laboratory, shop or other area where gas is used by students, except home economic rooms.

2. The shut-off valve at the gas meter shall be equipped with a handle or lever to permit easy operation of the valve. The OFF and ON position shall be plainly marked.

3. The gas meter and the shut-off valve shall be located so as to be conveniently accessible to building operation personnel. The valve shall be identified by an appropriate sign or tag.

4. The gas shut-off valve shall be located so that it can be reached by a person outside the building via a window, knock-out panel, door or other device to permit shutting off the gas should access from the inside of the building become impossible due to fire or other hazardous conditions. Location of gas shut-off valve shall be clearly indicated on exterior of building.

5. There shall be a shut-off valve at the street for the use of the utility company when it is desirable to shut off the gas in the school building.

6. All gas piping installations within a public school building shall be in accordance with the standards of the National Board of Fire Underwriters as set forth in Bulletin NBFU No. 54, dated August, 1959, and any subsequent amendments thereto.

7. All utility lines, including water, electricity, sewer, oil, air or other lines, at each point of entry into a school building, if below grade, shall be sleeved in a conduit and securely sealed with proper calking to prevent the seepage into the building of gas or other fumes.

8. Gas supply lines at each point of entry, exit or re-entry, into a school building shall be encased in a conduit, which conduit shall extend into a normally usable and accessible portion of the building and, at the point where the conduit terminates in the building, the space between the conduit and the gas piping shall be sealed to prevent the possible entrance of any leakage. The conduit shall extend at least four inches outside the building and be vented above grade. Vent pipes shall terminate outside the building at a point not less than two feet measured vertically or horizontally from any window or other building opening. The outer end of vent pipes shall terminate in a weather-proof and tamper-proof vent cap. They shall terminate sufficiently above the ground to avoid being obstructed with snow and shall be secured firmly to the building. The entire installation shall be such that the gas piping can be readily replaced without damage to the building. Vents in courts shall be extended to not less than five feet above the roof.

NOTE: Gas fired unit ventilators in classrooms are not approved at this time.

IX. MISCELLANEOUS

A. Lockers and Wardrobes

1. Provision shall be made for the storage of pupils' clothing. Where the clothing of pupils is to be stored in closed wardrobes, provision shall be made for the positive ventilation of such space.
2. Corridor lockers shall be recessed, ventilated and of non-combustible materials. (See section IV, B-1.)

B. Floors

1. Concrete floors without resilient floor covering shall not be permitted in instructional areas, except in shops.
2. Wood floors shall not be permitted in corridors, except in one-story buildings of frame construction.

C. Custodian's Service Areas

1. Custodian's service rooms with sinks and adequate storage space shall be provided, with a minimum of one such facility for each story, located to provide the greatest accessibility to the areas served. (For ventilation, see section IV, A-3.)

D. Duplex Outlets

1. Classrooms shall be provided with at least two duplex outlets.

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